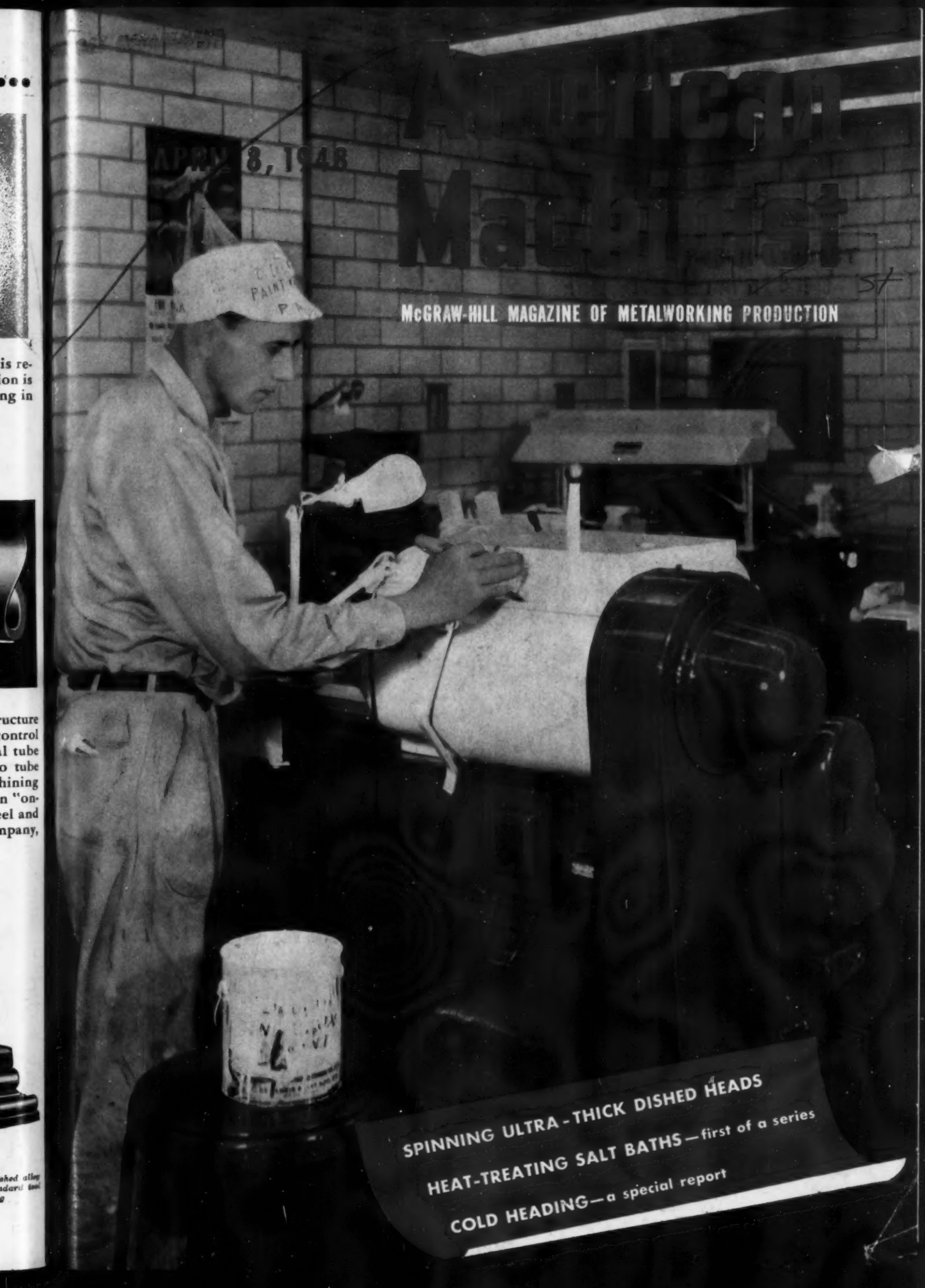
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AMERICAN
Machinist
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COLD HEADING—a special report

Compact design means simple operation

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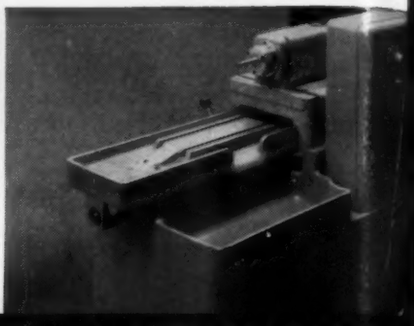

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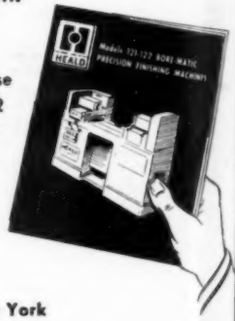

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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CONTENTS for April 8, 1948

VOL. 92, NO. 8

ADMINISTRATION

Editorial ..... *Burnham Finney* 81
Why You Cannot Get Ahead..... *James H. McGraw, Jr.* 110
Back Up Or Back Out?..... *Round Table* 120

SPECIAL REPORT

Fundamentals of Cold Heading..... *H. E. Linsley* 99

ENGINEERING

Dimensional Instability—4..... *Frederick C. Victory* 112
Weight of Steel Bar for 1000 Pieces..... *(RBS)* 141
Typical Ends of Commercial Helical Springs..... *(RBS)* 143

PLANNING AND MATERIALS HANDLING

Layout Controls Materials and Man Movement..... 85
Curved Chutes Aid Work Ejection..... *Harry S. Wharen* 88

ASSEMBLY AND HEAT-TREATING

Furnaces on Skids Add Forging Flexibility..... 92
Heat-Treating Principles and Salt Baths—1..... *Haig Solakian* 96
Pistons and Con Rods Machine Assembled.... *Chester S. Ricker* 111

MATERIAL CUTTING, FORMING

Spin 6-in. Thick Steel Plate..... 83
Group Parts Multiple Machined..... *F. H. Scriber* 90
How to Get the Most Out of Punch Presses—4.... *E. H. Girardot* 116
Milling Machine Cuts Slotted Cams..... *Frederick C. Lurz* 121

TOOLING

Progressive Die Slashes Tooling..... 86
Hard Facing Improves Tool Life..... 94
Short Cuts..... *A. H. Waychoff* 115
Bar Setup on Planer Locates Trace..... *Ralph Egolf* 122
Fixture Winds Special Springs..... *James F. Bolton* 122
Attached Mechanism Loads Balls in Lot Numbers.... *Joe Manuiss* 122
Lathe Spider Suppors Cylinder..... *Robert J. Lemp* 123
Depth Gage Measures Deep Holes..... *Edward Diskavich* 123
Cup Wheel Surfaces Snap Gages..... *Ed Babin* 123
Makeshift Micrometer for Large Work..... *George Werner* 123
Dividers Make Layout from Hole as Bearing.... *Norman Ingalls* 124
Mold Plate Lifted by Internal Wedge..... *F. G. Forquer* 124
Guard Strengthens Welder Shunt..... *Gordon A. Ream* 124
Block Gage Centers Jig Borer..... *Chris Sorenson* 124
Double Spindle Strengthens Gage..... *Charles H. Marsteller* 125
Pin Gage Aids Tube Measurement..... *Martin H. Ball* 125
Fixture Holds Pins for Milling..... *H. Moore* 125
Washer Holds Stud in Small Hole..... *James Keating* 125
Drill Shank Holds Centerdrill..... *Allen B. Nixon* 126
Broken Die Supported in Block..... *Frederico Strasser* 126
Removing Bushings in Blind Holes..... *Hans Schmidbauer* 126
Methods of Driving Straight Shank..... *(RBS)* 145

NEWS OF METALWORKING

Spot News..... 77
Gaging Business..... 78
Tool Show..... 127-130
Detroit News..... 133
Names in the News.... 188, 190, 192, 194

DEPARTMENTS

Talking Shop..... 93
Reference Book Sheets.... 141
Shop Equipment News.... 147
Parts and Materials..... 160
Round Table Discussions.. 164
Quotes 174
Seen and Heard..... 180
New Books..... 182
To the Editor..... 186

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Chips and QUIPS

Our Cover . . . Spring cleaning is a shop, as well as home, essential. Frequent repainting keeps shop equipment sparkling, helps operators do a better job. Cleveland Graphite Bronze Co. repaints machines every six months; our cover shows the job in process, suggests a similar course for you. Good lighting is a necessary accessory, as you can see at upper right. G.E.'s Lighting Division at Nela Park took the picture for us.

A good second reason for the Kodachrome this month is that April marks the tenth anniversary of fluorescent lighting for plants.

Header . . . We set cold heading down as a potential Special Report subject because we thought there should be a comprehensive handbook on it available, but, Associate Editor Linsley reported, there was no literature on the art. Equipment makers suggested he speak to users; users suggested he speak to makers. So Jim spoke to both, has put together 16 pages of definitive data to follow up the articles by Walter France and Chester Ricker in previous issues. There'll be reprints, as usual.

Spinning . . . For a couple of years, we've been feeling that we should have a story about spinning metal. Mighty useful process, but where we've seen it, it has been in the hands of a hoary ancient, almost as old as his lathe, and using the methods our grandfathers knew. It's a trick of brain and muscle . . . But here we spin a yarn on spinning, from Lukens Steel. Big tank heads, as much as 5 in. thick, spun. You'll believe it when you see the pictures.

Spraying . . . Sixteen years ago, more or less, we introduced metallizing, calling it the long-sought "putting-on tool." There were stories aplenty to follow, so many the subject got a bit threadbare—a very useful process, very familiar. But Louis Barrett of Glenn L. Martin Co. brings out a newer angle, metal-spraying hard facings on tools. He tells herewith how the process increases tool life 14 times.

Step Up . . . While the stories he ferreted out on the West Coast continue to appear, Harry Wharen's name leaves our masthead. There's a good reason: He's the new chief editor of the *McGraw-Hill Digest*. This companion magazine needed a good engineer-editor; we had him.

Tooling . . . This issue is packed with tooling data. There's the description of a very tricky progressive die to make a little clip for a fluorescent fixture, an explanation of how to group small runs on low-cost fixtures, a picture story on Ford's new assembly machine for pistons and connecting rods. The latter avoids an inspection operation, because the machine stops and signals if lock rings don't go in right. What's more, 10 assemblies are completed per minute . . . There's another progressive die story, too, from A. O. Smith Electrical on the West Coast. Curved chutes handle lamination punchings.

Serials . . . Our two current serials reach Installment IV with this issue. Fred Victory finishes his discussion on dimensional instability with the data on residual stresses; E. H. Girardot tells how to choose between compound and progressive dies for a punch press.

Incidentally . . . Chester Ricker reports Detroit automotive executives are using a "tax slide rule" which tells high-bracket brass hats how many dollars they have to earn in order to hang onto one . . . A Detroit ad agency recently sent a booklet to Ray Sackett of the SAE addressed "Society of Automotive Eugenics."

Coming . . . April 22 *A.M.* will again be a crowded issue. There's a special report on swaging, which with cold heading rounds out our two reports on Forging last year. Then there are descriptions of a tricky broach-tap, a hopper feed, a way to print lettering on plastics, pictures of operations at Electromotive, something on wear of metals and on materials handling, plus installments on punch presses and salt baths.

SALT BATH EXPERT . . . Dr. Haig Solakian, whose series of three articles on salt baths for heat treating begins in this issue, was until recently vice president of the A. F. Holden Co., but is now president of John Ek Industries, Inc. Guilford, Conn.

Dr. Solakian's, whose degrees include B.S., M.S., and Sc.D. from MIT, has done fundamental research on aluminum alloys, H5 steels, heat treatment on all types of salt baths. He did several years of metallurgical research at the Bureau of Standards, and was chief metallurgist and director of research at various plants. He is a frequent author, a member of the ASTE and ASM, as well as chairman of the New Haven Chapter, ASM.

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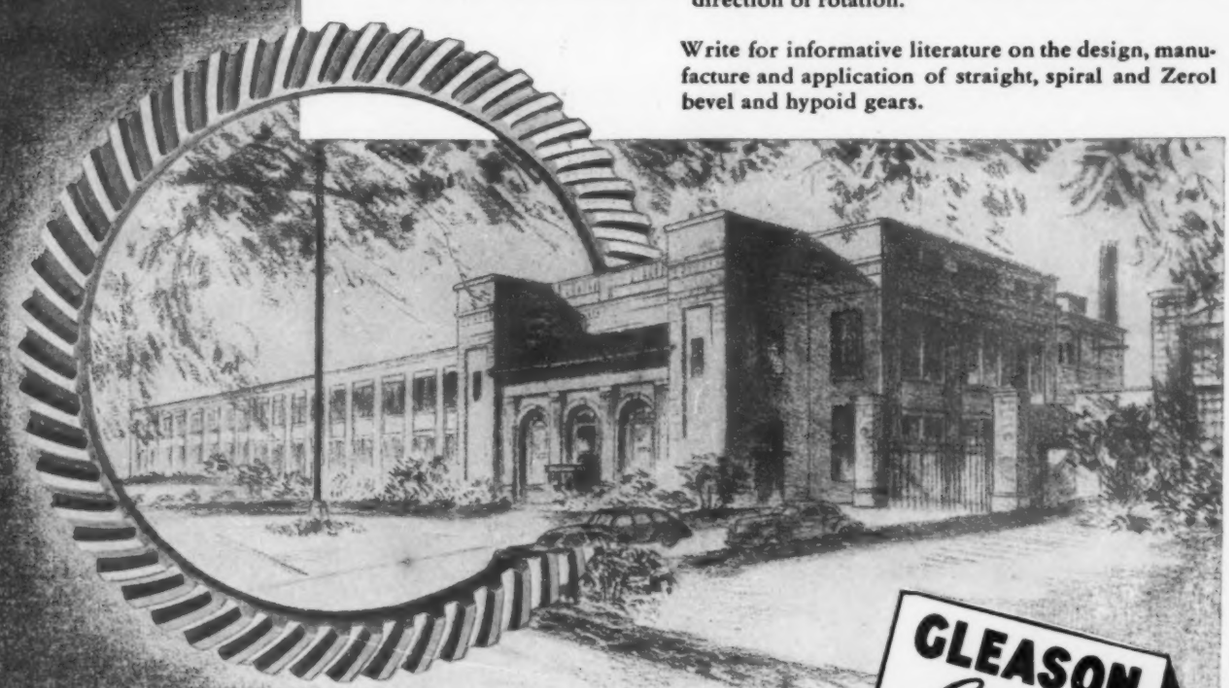
Write for informative literature on the design, manufacture and application of straight, spiral and Zerol bevel and hypoid gears.



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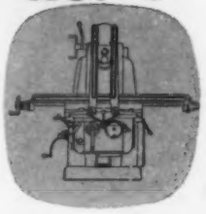
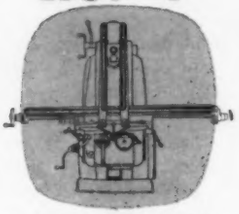
*88% *according to American Machinist Survey*

NO. 3



No. 3 Dual Power Dial Type
34 in. table travel
20 hp motor

NO. 4

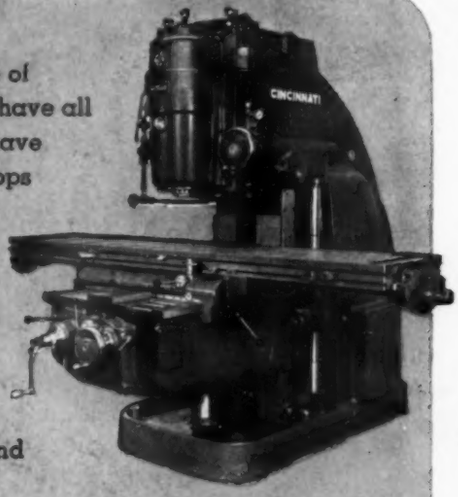


No. 4 Dual Power Dial Type
42 in. table travel
30 hp motor

Now they're available in four sizes . . .

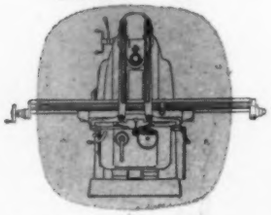
CINCINNATI DUAL POWER AND HIGH POWER DIAL TYPE MILLING MACHINES

● A heavy duty miller in every sense of the word, the High Power Dial Types have all the features of the Dual Powers, but have lower hp ratings. They're ideal for shops handling milling operations on large parts with high-speed steel cutters; and for shops handling a variety of operations, some on large parts, and some on smaller parts tooled up for automatic milling. They're made in Nos. 3, 4, and 5 sizes, plain, universal and vertical styles, and No. 6 size, plain and vertical style.



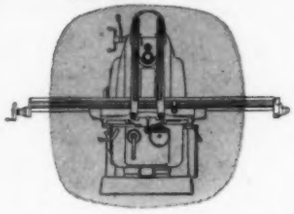
CINCINNATI No. 5
Vertical Dual Power Dial Type
Milling Machine.

NO. 5



No. 5 Dual Power Dial Type
50 in. table travel
40 or 50 hp motor

NO. 6



No. 6 Dual Power Dial Type
60 in. table travel
40 or 50 hp motor

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES

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For those small hard-to-grind jobs

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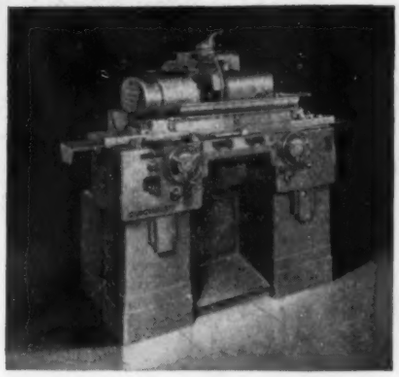
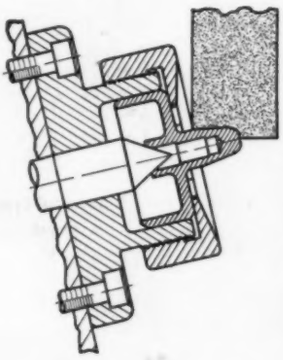
CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are built in 4" x 12", and 4" x 18" sizes. Complete specifications may be obtained by writing for catalog G-551.

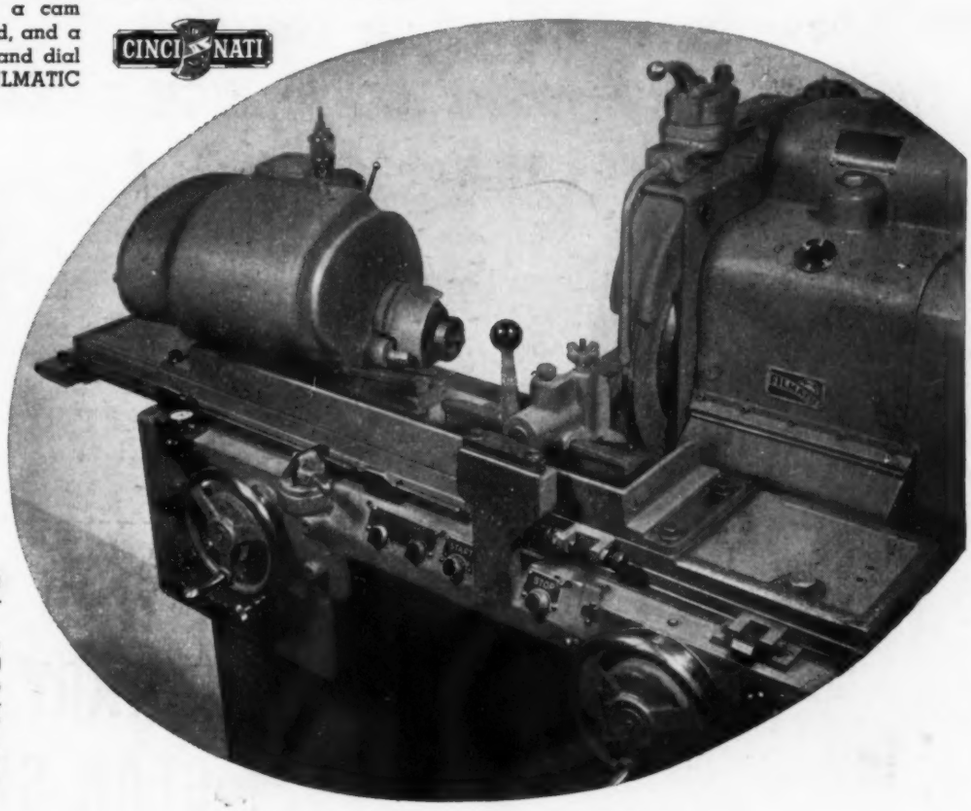


Machines which can be readily tailored to facilitate difficult grinding operations offer two principal advantages: 1) maximum production, 2) minimum investment. An example of this type of equipment is shown in the photograph below. ¶ Starting with a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder, Cincinnati Application Engineers removed the standard swivel table, headstock and footstock, and replaced them with an upper table having a 12½° angular section for the headstock, a live spindle headstock with a special chucking device, a profile truing attachment operated from a cam attached to the machine bed, and a latch device, positive stop, and dial indicator for the table. The FILMATIC bearing wheelhead was retained. ¶ With the aid of an automatic infeed unit, the machine form grinds the stem diameter of stainless steel valves in one chucking of the work. ¶ This is another example of Cincinnati Application Engineering in low-cost precision grinding. Their many years' experience is at your disposal. A letter from you, with a blueprint of the part stating complete requirements, will enable these engineers to help you do a better grinding job at lower unit cost, and with minimum operator fatigue.



Drawing of part and chuck, showing wheel in contact with ground surface.

Part name.....Valve
Material.....Stainless Steel
Operation.....Grind form
Production.....38 per hour
Machine—CINCINNATI FILMATIC 4" Plain Hydraulic Grinder with special equipment tailored for the job.



Close-up of special equipment applied to a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder, to form grind the stem diameter of stainless steel valves by the infeed method.

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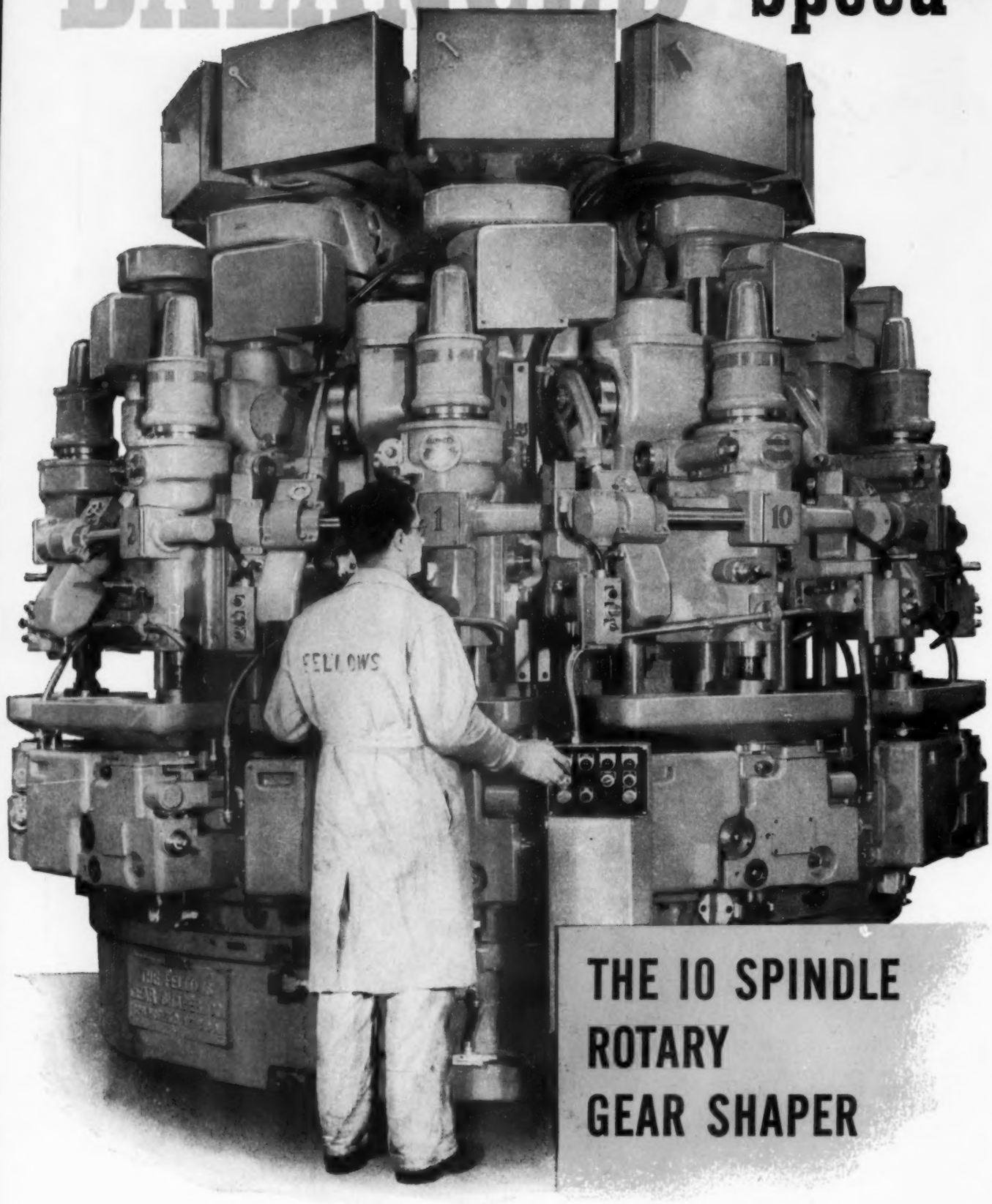

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3 pieces per load
Steel, 51 teeth, 24 pitch, 14½° P.A., 20°21'51"
L.H. helix, .090" tooth depth, .438" face width.

...plus

301 PER HOUR ON 4 STATIONS
3 pieces per load
Steel, 39 teeth, 24 pitch, 14½° P.A., 20°21'51"
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Combined

ON ONE BIG MACHINE

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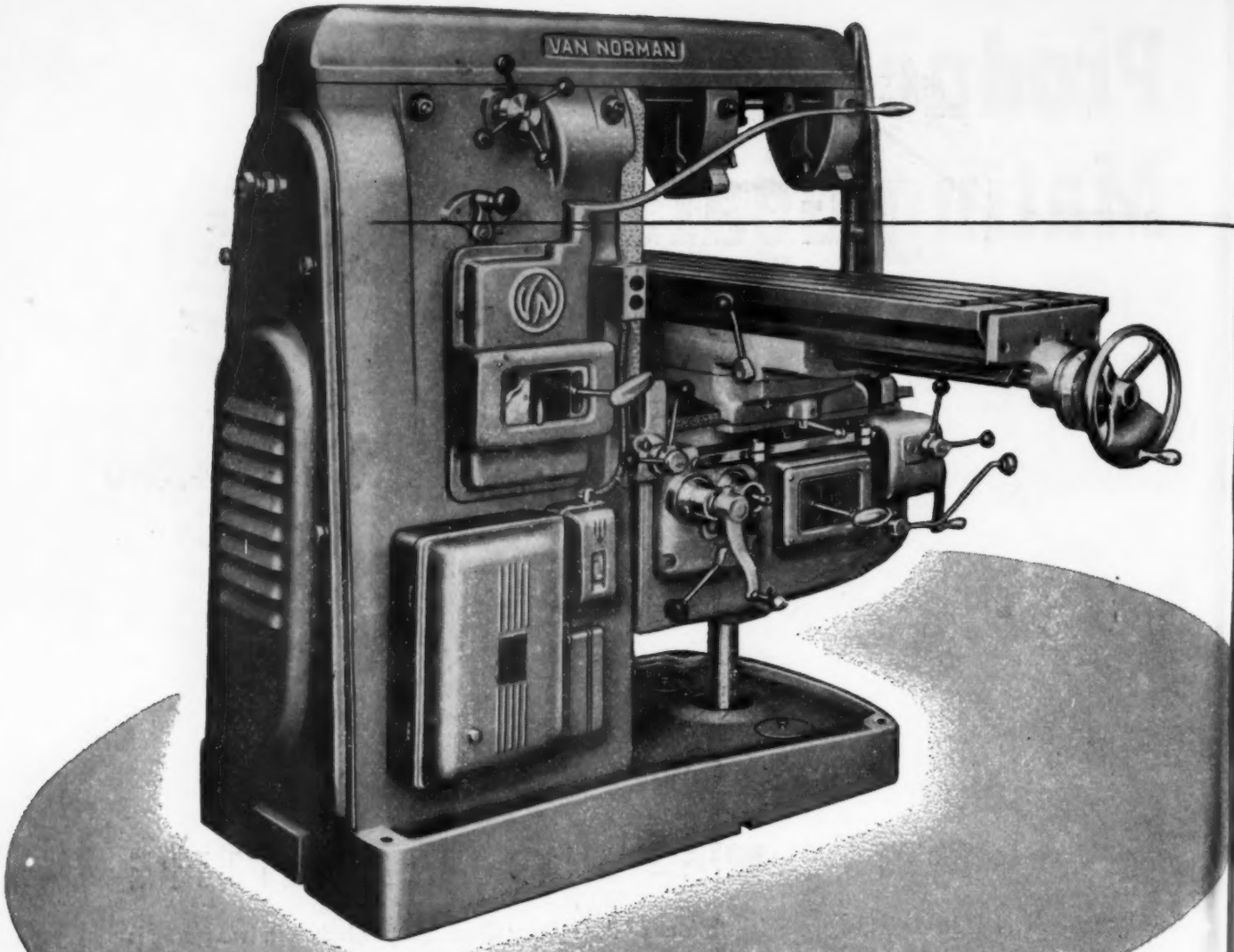


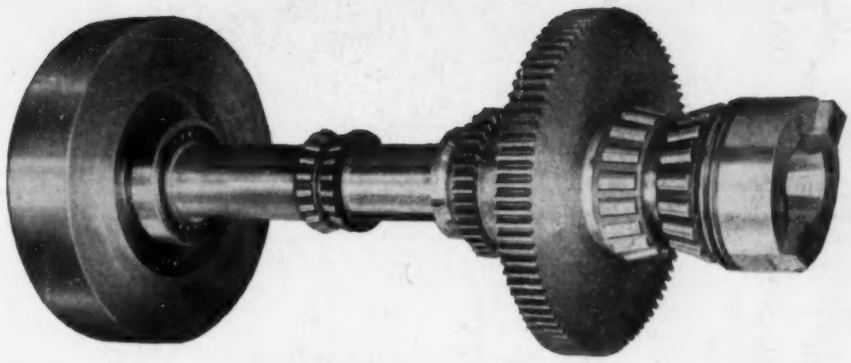
Van Norman No. 3 STANDARD

HORIZONTAL MILLING MACHINE

Especially designed for a wide range of general purpose and production milling, the Van Norman No. 3 Standard Miller provides many advantages that speed up production and cut costs.

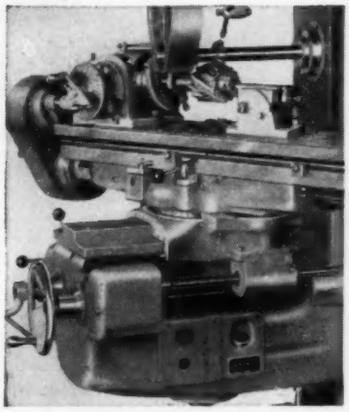
Heavy built-in spindle flywheel increases the cutability of the machine . . . assures smoother work finish. Front and rear directional controls of all power feeds, six-way rapid traverse, and hand adjustments provide convenience of control and operation. Single lever feed selector and single lever speed selector permit quick, easy selection of 18 speeds or 18 feeds. Overarm pilot wheel permits easy positioning of heavy overarm. These plus other Van Norman features assure high speed, cost cutting milling on all types of work. The No. 3 Standard is available with plain or universal saddle. Write for information.

VAN NORMAN COMPANY

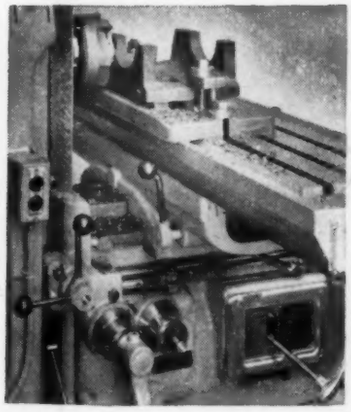


Heavy Built-in Spindle Flywheel Improves Cutability and Accuracy of Van Norman No. 3 Standard Milling Machine

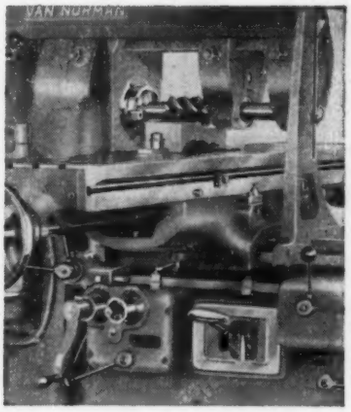
One of the outstanding advantages of the Van Norman No. 3 Standard Miller is the spindle design which incorporates a heavy built-in Spindle Flywheel and 5 anti-friction bearing support. The heavy flywheel provides smooth uninterrupted transmission of power to the cutter. It increases workability and improves finish on the work piece. The 5 anti-friction bearings . . . double-opposed in front, double-opposed in center, and single in rear . . . support the large alloy steel spindle. They assure maximum rigidity and spindle strength under all types of cuts.



No. 3 Standard Universal Milling Machine set up with vertical swivel dividing head and enclosed gear drive for milling a spiral cutter.



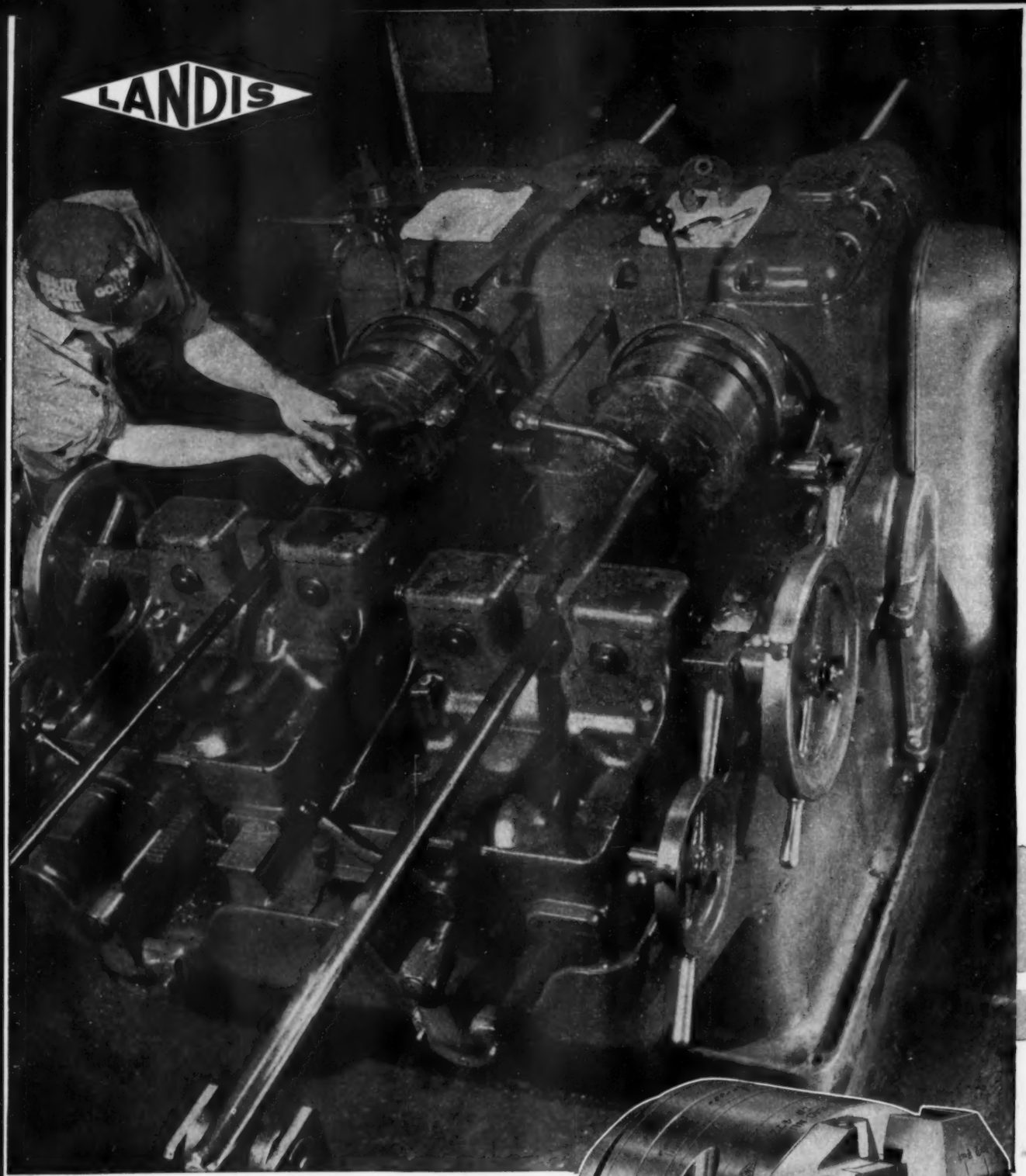
The flywheel on spindle of No. 3 Standard Milling Machine assures smooth application of power to the carbide face mill.

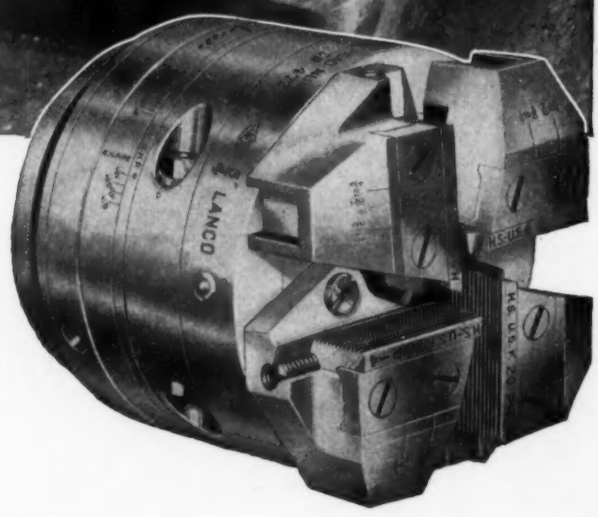


Production milling with helical plain milling cutter. Heavy duty feed and speed transmissions with large column and knee provide maximum rigidity.

SPRINGFIELD 7, MASSACHUSETTS

LANDIS





The precisely built ultra-modern LANDMACO Threading Machine producing continuous thread studs to close tolerances.

Continuous Threaded Studs Produced at Low Cost

With **LANDMACO THREADING MACHINE**

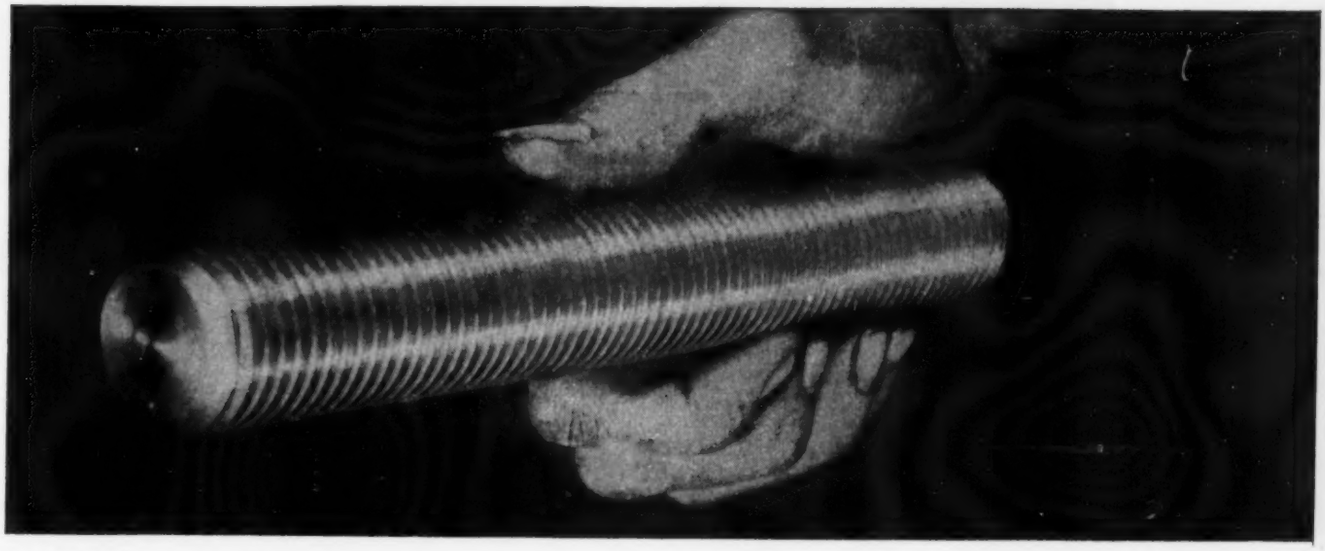
The Landmaco Threading Machine assures low production cost and the close thread tolerances on the continuous thread stud bolts used extensively in valves and high pressure piping.

The full length bars are first threaded with the Landmaco Machine, after which the studs are cut to length. The threads are cut to class 3 specifications and even though the material is tough alloy steel, 6 to 8 full length bars are threaded per grind of the chasers assuring low threading cost.

Write for Bulletin H-75, descriptive of the Landmaco Threading Machine. Investigate its advantages in handling your threading operations.

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·



LANDIS TOOL universal grinders

for these precision grinding jobs

straight cylindrical
shoulder
taper
face
internal

12" x 28" Universal & Tool

12" x 36" Type LCH Hydraulic Universal equipped with internal grinding fixture

(Internal fixture raised for external grinding)

(Internal fixture lowered for internal grinding)

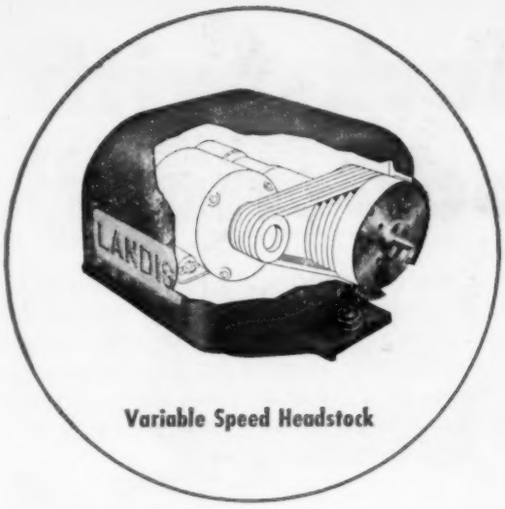
	Variable Speed Headstock Drive	Microsphere Spindle Bearings	Hand and Automatic Wheel Feed	Hydraulic Table Traverse	Two Speed Hand Traverse
*12" x 28" Universal & Tool	✓				✓
10" x 20" Type H Hydraulic Universal	✓	✓	✓	✓	✓
10" x 24" Type CH Hydraulic Universal	✓	✓	✓	✓	✓
12" Type LCH Hydraulic Universal	✓	✓	✓	✓	✓
14"—18" Type C Hydraulic Universal	✓	✓	✓	✓	

*The 12" x 28" Universal and Tool is equipped with precision anti-friction spindle bearings, adjustable mechanical table traverse and coarse and fine feed for the grinding wheel.

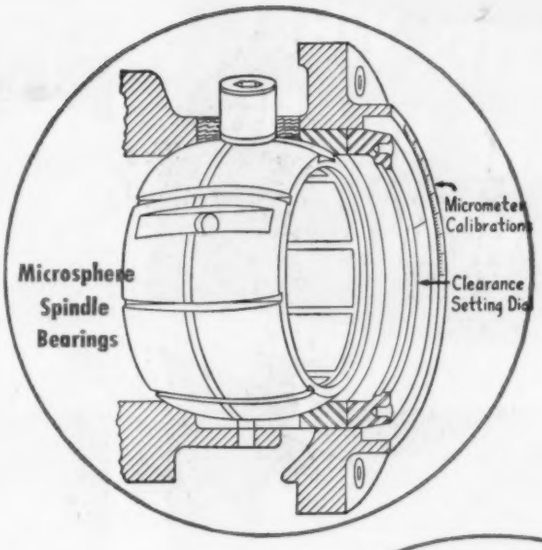
10" x 20" Type H Hydraulic Universal

10" x 24" Type CH Hydraulic Universal

LANDIS TOOL *Precision Grinders*



Variable Speed Headstock



outstanding design features

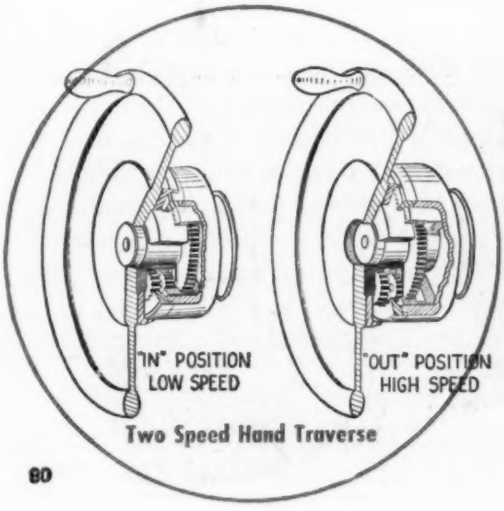
rapid set-up

high production

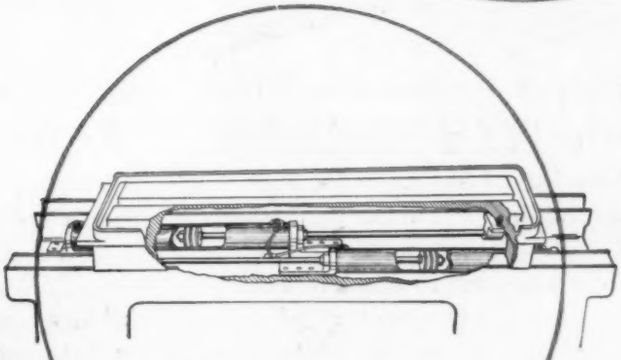
fine finishes

close tolerances

Hand and Automatic Wheel Feed



Two Speed Hand Traverse



Position of Traverse Cylinders in Bed

Hydraulic Table Traverse

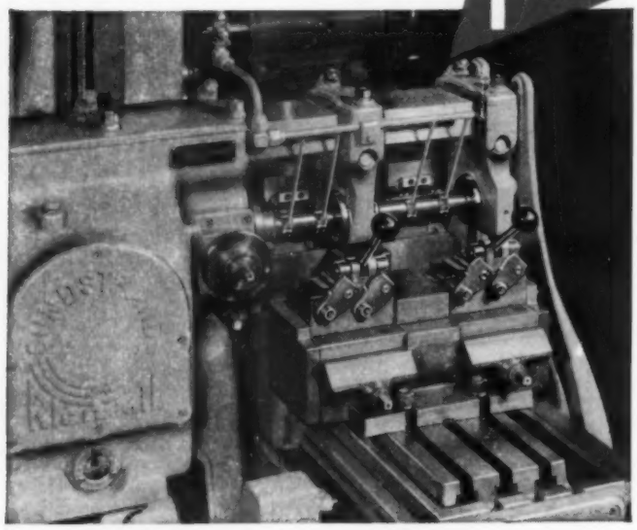
LANDIS TOOL COMPANY, WAYNESBORO, PENNA.

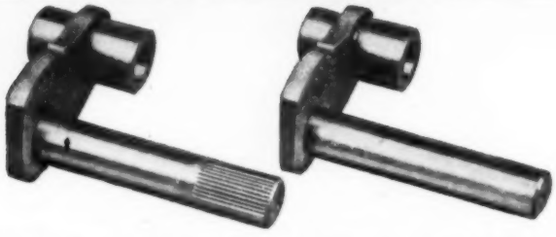
NO MATTER WHAT YOU ARE MILLING ...OR HOW!

√check with production"

Basically, there are two approaches to solving milling production problems, (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method — standard or semi-

1

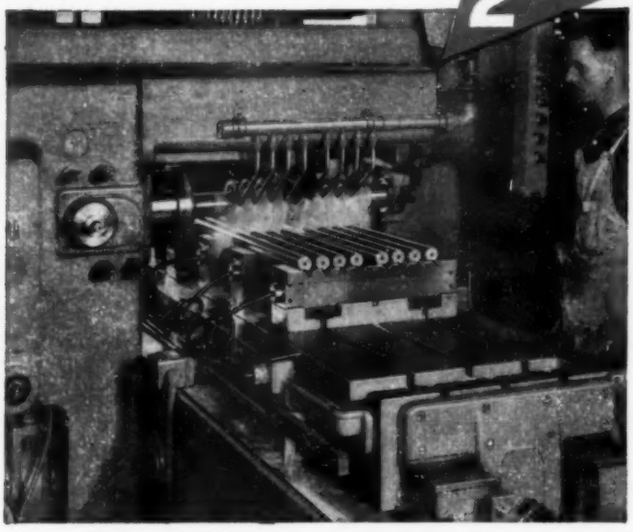




Milling Serrations in 4 Automotive Shifter Shafts Simultaneously ON A STANDARD RIGIDMIL

Here's a standard Sundstrand Rigidmil equipped with special tooling for milling serrations in 4 shifter shafts at one time. Four serrating cutters are mounted on an arbor which is supported by standard overarm support. Two work-holding fixtures, each of which holds 4 parts, are mounted on machine table. Using a standard two-way automatic table cycle, operator loads four shafts at one end while four shafts are being milled at the other end. Tooled in this manner, this standard Rigidmil completes 185 shafts every hour.

2



Milling Multiple Keyways in a Variety of Shafts ON A SEMI-STANDARD RIGIDMIL

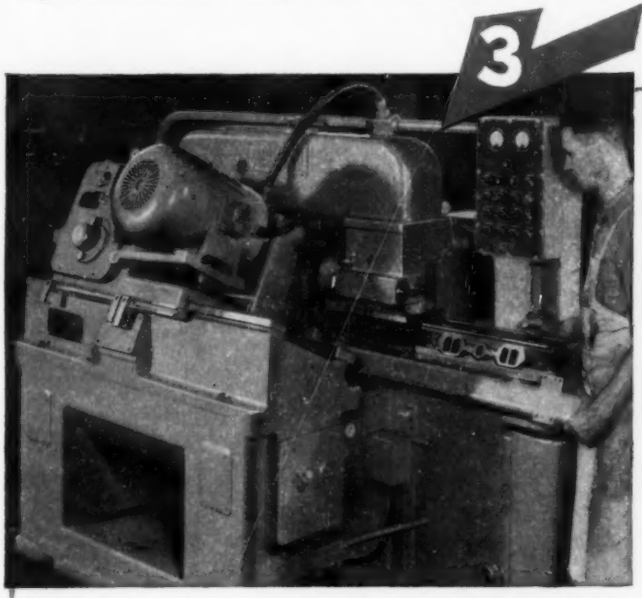
In this case a single spindle Rigidmil is equipped with a special overarm and arbor support bracket. It mills multiple keyways at various depths in tractor shafts. Machine is provided with vertical feed attachment and necessary controls to give 4 automatic head movements in combination with skip table feeds. By combining head and table movements, as many as 4 keyways of different depths are milled in one automatic cycle. Eight shafts are cut simultaneously while being held in fast loading and unloading magnetic work chucks.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

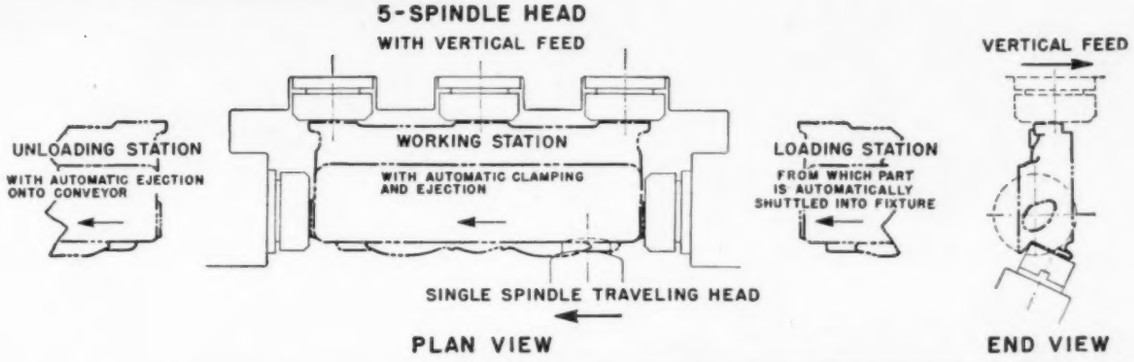
Sundstrand "engineered for *Better Milling Methods*

standard machines, if possible, or entirely special machines, if necessary . . . This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling. The following is a brief resume of the complete engineering and manufacturing service available from Sundstrand to meet all or any of your production milling requirements in small and medium size work. Check these actual examples which reveal one of each of the methods used in solving milling production problems. One of these methods may be the solution to your present problem.



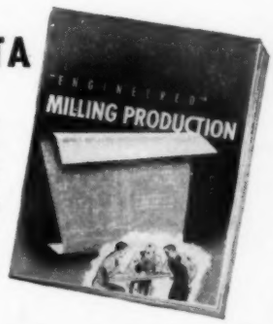
Milling 4 Sides of Cylinder Head Simultaneously with SUNDSTRAND SPECIAL RIGIDMIL

This special Sundstrand Rigidmil mills the angular face, pads on opposite side and at both ends of an automobile cylinder head simultaneously. Transfer of the part through 3 stations, locating and clamping in the working station and cycling of the heads is completely automatic. First, the work rolls onto loading station from conveyor. Then, in fully automatic cycle, part is shuttled into the fixture and clamped; the single spindle angular head starts its horizontal feed to mill the angular face — while the 5-spindle head feeds vertically to mill 3 side pads and a pad on each end. When all cuts have been completed, the angular head cutter retracts to clear the work and both heads rapid return. Clamps release the finished part which is then automatically shuttled out of the fixture as another rough part enters. Production is approximately 65 Cylinder Heads per hour.



FREE ADDITIONAL DATA

Write for more proof of the successful application of Sundstrand "Engineered" milling production. This new 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 170.



SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

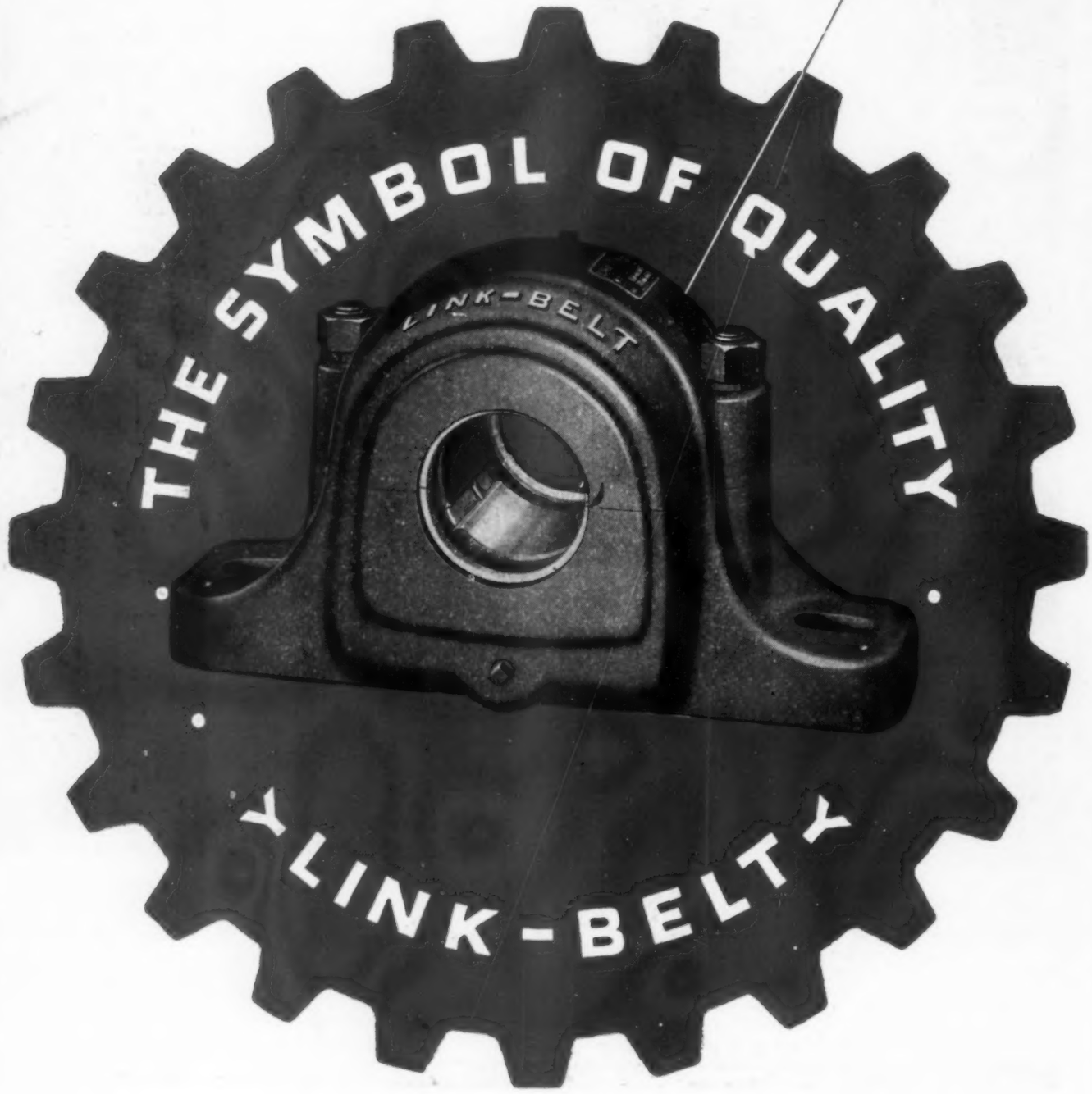
DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

LINK-BELT Ball and Roller Bearings

The Link-Belt Line of Self-Aligning Ball and Roller Bearings is *complete*, and you will have no difficulty in selecting the proper bearing in mounted and unmounted types (from Books 2094, 2095 and 2196 sent upon request) for all general industrial use. For use of ball and roller bearings as an integral part of machine design and construction, we invite you to discuss your problems with our engineers.

LINK-BELT COMPANY

Indianapolis 6, Chicago 9, Philadelphia 40, Pittsburgh 19, Atlanta, Dallas, Cleveland 13, Minneapolis 5, San Francisco 24, Houston 2, Los Angeles 33, Seattle 4, Toronto 8, Offices, Factory Branch Stores and Distributors in Principal Cities. 10,943



GRAY SPACE SAVER DRIVE....

Designed for double housing and open side planers the Gray Space Saver Drive (pat. app. for) gives these extra advantages:

- GRAY "Floating Shaft" eliminates usual flexible coupling with its noise and backlash, as well as wear on bearings caused by motor misalignment.
- Maximum load carrying capacity with enduring smoothness of motion.
- Fewer gears, shafts and bearings needed.
- Protects motor from dust and grit.
- Saves valuable floor space.

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

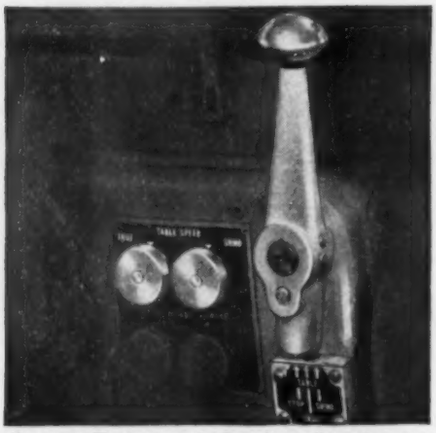
5 More Reasons for

Dwell Control Right and Left Hand Table Dwell separately regulated by easily operated controls conveniently located in the center of the operating position.

Work Jogging By movement of this fingertip lever, work may be jogged at any time—whether work rotation is being automatically or manually governed.

Work Rotation Control May be either manual or automatic—at the will of the operator. A flip of this switch brings about immediate change from one to the other.

Automatic Feed at Reversal Automatic Wheel Feed at each table reversal may also be used—at the will of the operator. This automatic feed is adjustable from zero to .003" by this very simple control.



Pre-set Truing and Grinding Speeds This feature maintains separate table speeds for truing and for grinding as determined from the first work piece of the job. Immediate selection by main control lever.

SEVEN other popular features:

base ways protected at all times by space-saving steel strip guards • automatic coolant control • hinged wheel guard covers and rear base design facilitate wheel changes • pumps and electrical equipment located for maximum accessibility • sensitive, easily operated hand table traverse • smooth, all Vee-belt driven headstocks • piston rods always in tension — no buckling.

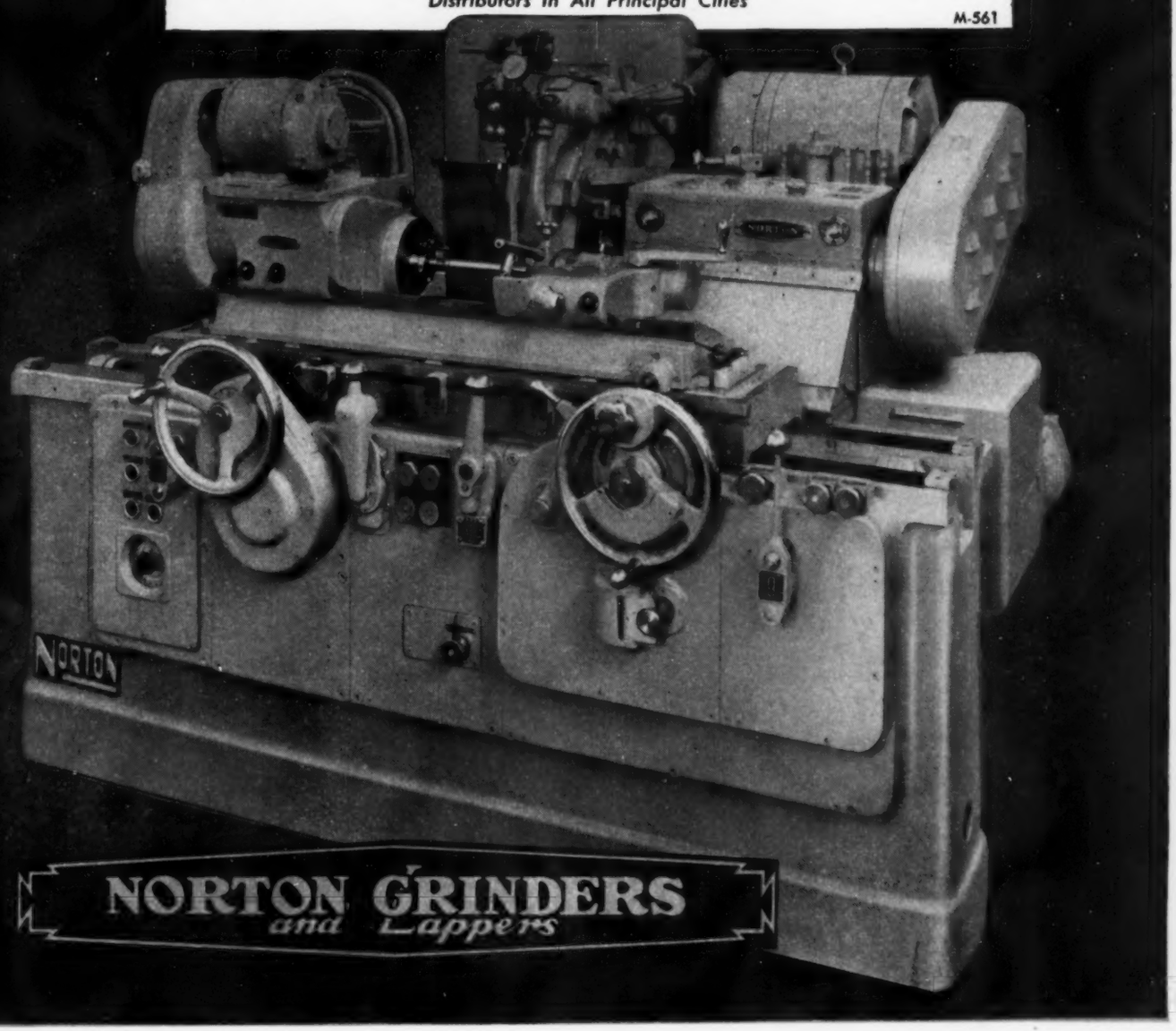
the Popularity of the new
NORTON TYPE CTU CYLINDRICAL GRINDER

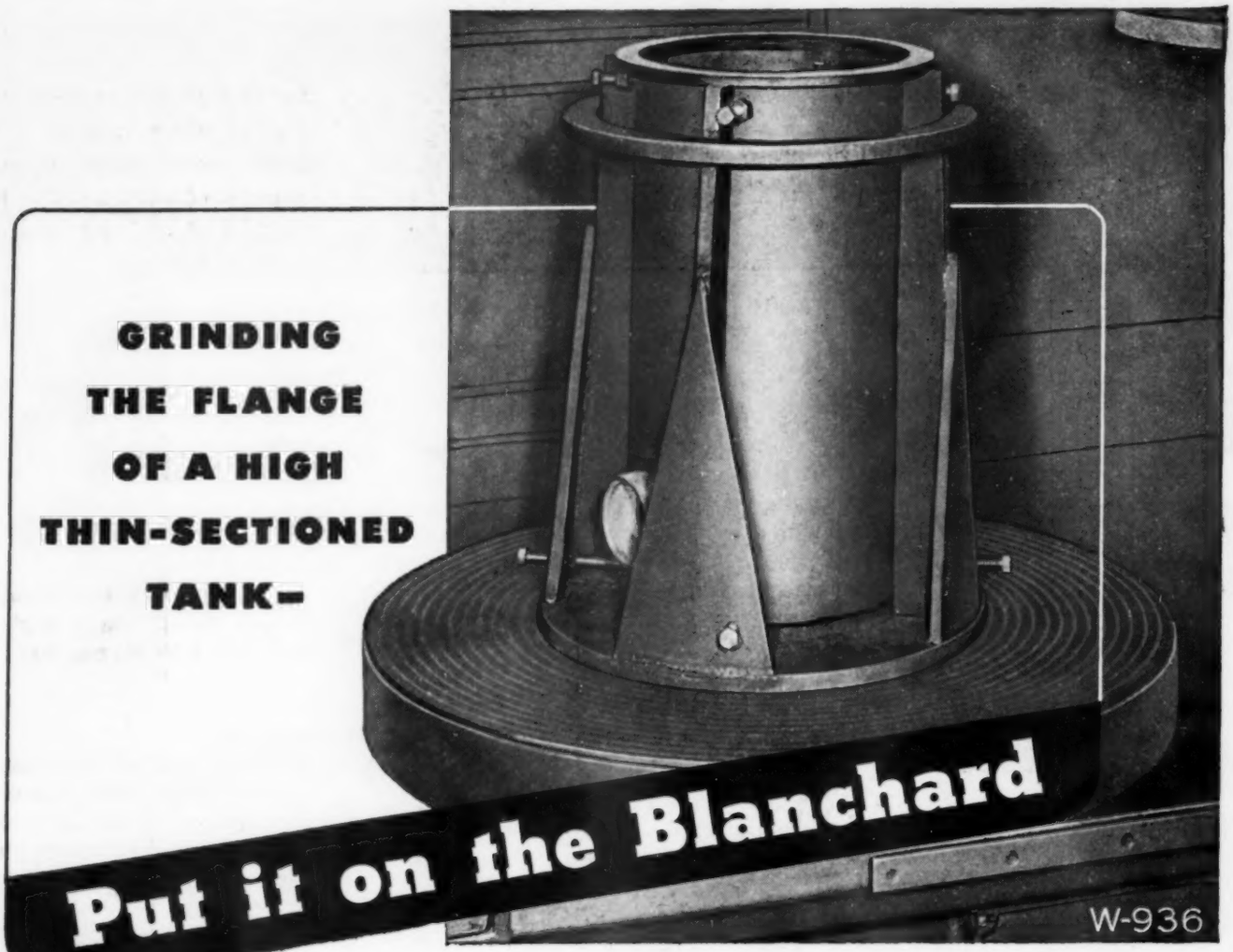
MANY features of the new Norton Type CTU line act to speed up output by incorporating in these grinders a high degree of operating convenience. Thus they allow the operator more time to pay attention to the things that really get work properly done.

Coupled with this operating convenience are sound engineering and well proportioned design which assure sizing accuracy, high surface finish and minimum maintenance costs. Thus, the Norton CTU line has so many investment returning features that it should be included in any of your retooling programs. Catalogs available on both the 6" and 10", plain and semiautomatic — no obligation.

NORTON COMPANY, WORCESTER 6, MASS.
New York - Chicago - Detroit - Cleveland - Hartford
Distributors In All Principal Cities

M-561





Here's another profitable "Yes" answer to the question, "Can we put it on the Blanchard"? Supported in a typically inexpensive, Blanchard-designed fixture, this Filter Tank for Gasoline Purification is held on the 36-inch chuck of a No. 18 BLANCHARD SURFACE GRINDER.

The tank is of welded steel, one foot diameter and two feet high. Stock removal from the flange averages 1/16". The surface must be flat, with a good finish. Production is six pieces per hour.

Let Blanchard grinding engineers assist you in solving *your* flat surface grinding problems. Send us your prints and data—also samples if possible. You'll quickly get reliable recommendations and production estimates. This service is free and places you under no obligation.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Sure it's big work for a 20-inch lathe but she does a swell job..."

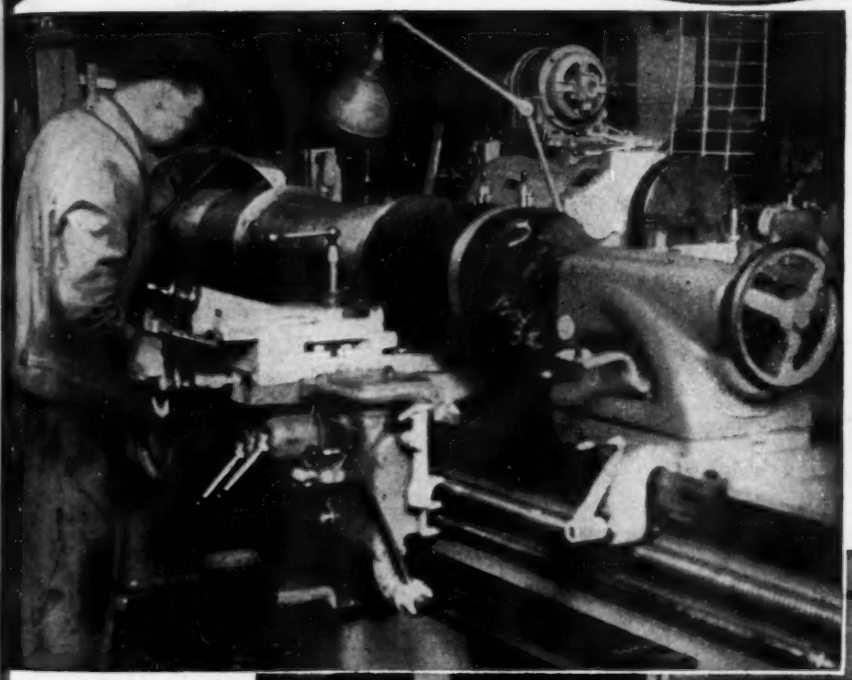
In these few words the superintendent of a prominent railroad shop expressed approval of his "AMERICAN" Pacemaker Lathe.

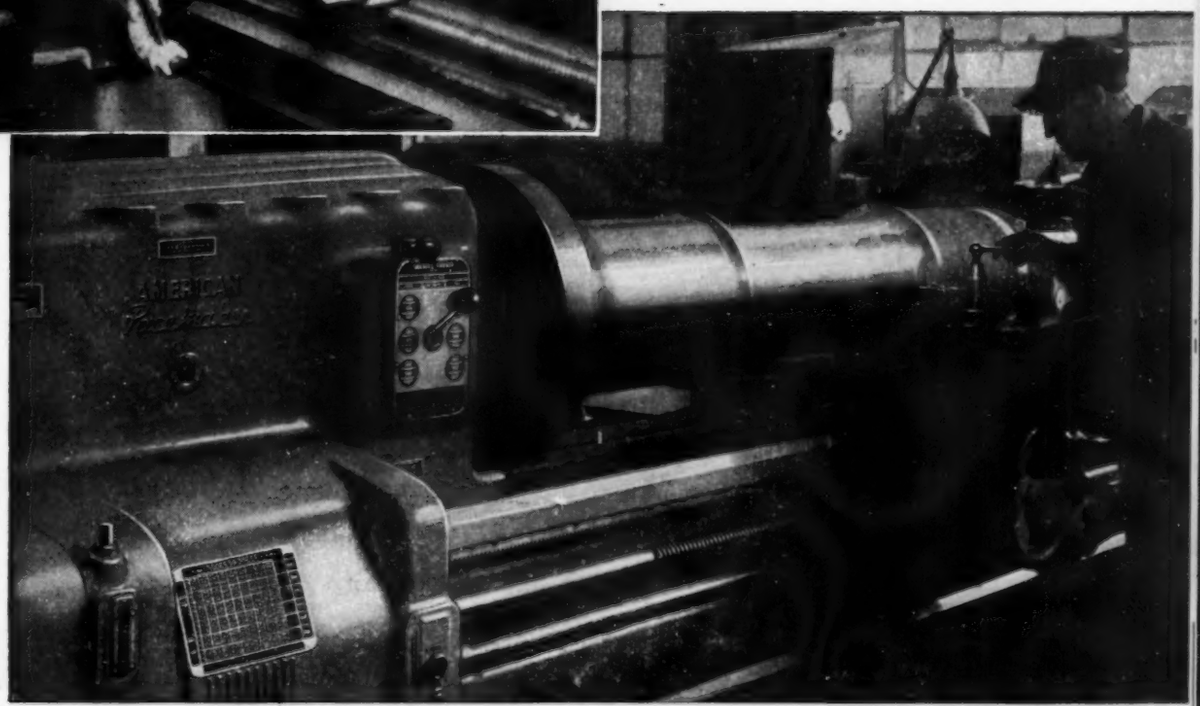
He particularly likes—

1. The power and speeds for using cemented carbide tools to their limit.

2. The ruggedness and stamina which permit large work to be done without chatter.

3. The ease and convenience of control which saves operating time and encourages operator to use correct speeds and feeds.





"American" Pacemaker Lathes are favorites in many of our best railroad shops. They are dependable, low-cost producers. Send for descriptive bulletin No. 16.

"American" Hole Wizard Radial Drills are also doing a fine job for the railroads.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

A BUYING GUIDE FOR ABRASIVES

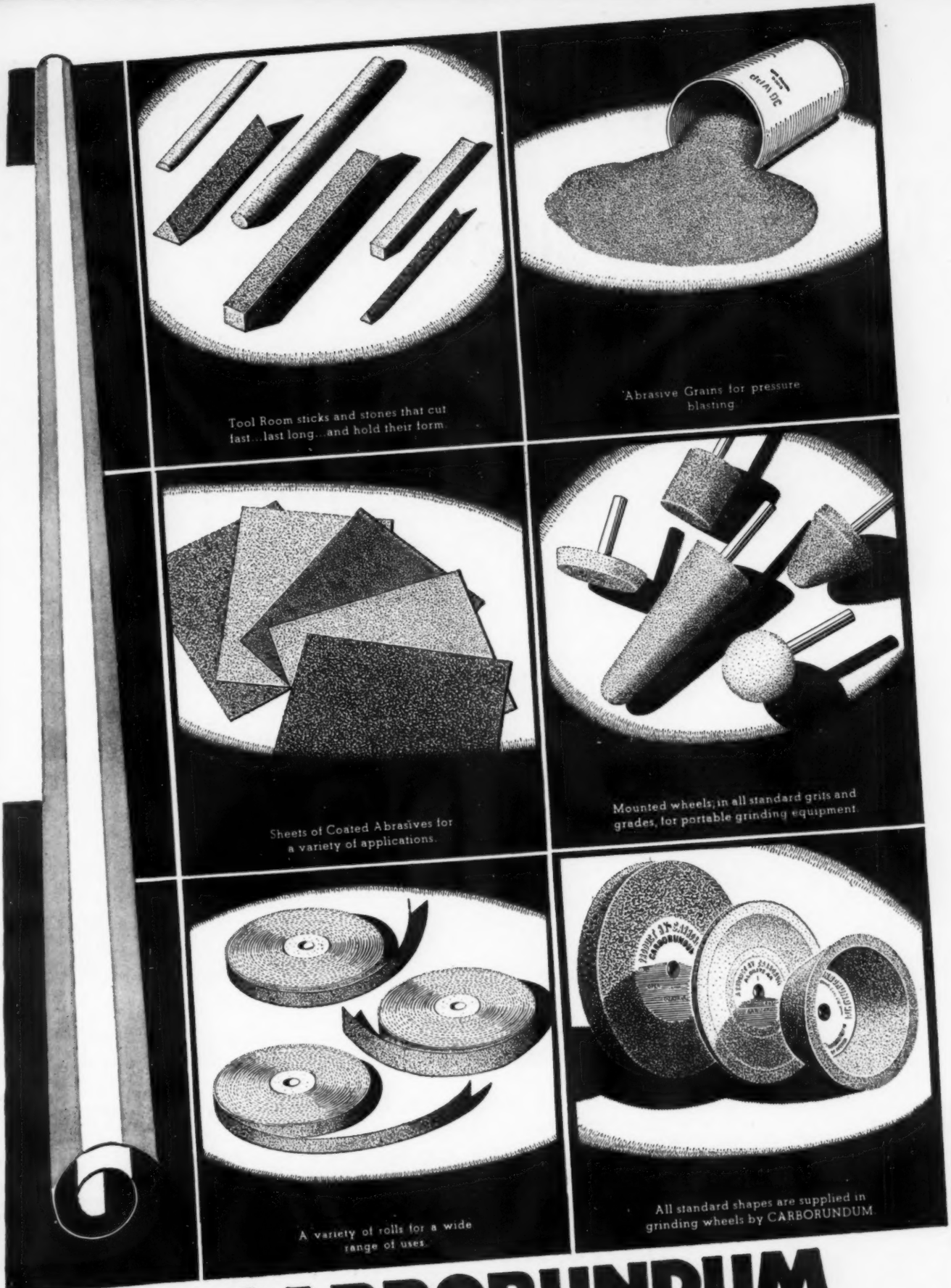
ABRASIVE PROBLEM:
Is there a better abrasive or technique for the job?

ANSWER BY
CARBORUNDUM
TRADE MARK

Key step between research and abrasive user, "Product Development" is an important activity at The Carborundum Company. Aimed at the development and application of the right abrasive in the right place, it brings about closer cooperation among abrasive machine builders, abrasive users, and our own research.

Products and techniques are rigidly tested and evaluated for both grinding wheels and coated abrasives. Suggestions are investigated and analyzed. Vital information is collected and interchanged. Facts and figures are checked and correlated. The net result is realized in more effective selection and application of abrasives . . . another reason for preferring products by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

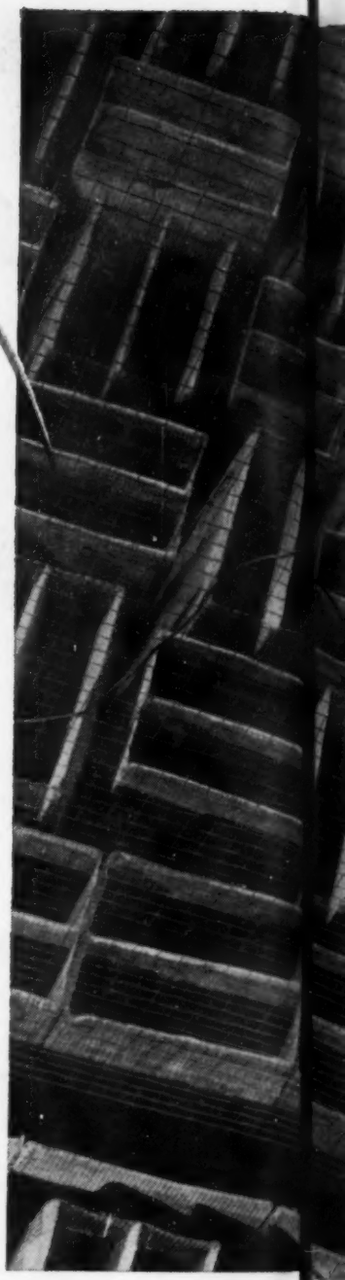
A Good Rule for Good Grinding


Tool Room sticks and stones that cut fast...last long...and hold their form.
Abrasive Grains for pressure blasting.
Sheets of Coated Abrasives for a variety of applications.
Mounted wheels, in all standard grits and grades, for portable grinding equipment.
A variety of rolls for a wide range of uses.
All standard shapes are supplied in grinding wheels by CARBORUNDUM.

... CALL IN **CARBORUNDUM** TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

Even a heartbeat can be heard in this amazing room!



ESPECIALLY constructed with a spring-supported wire mesh floor, this room in the Bell Telephone Laboratories in Murray Hill, New Jersey, is being used to aid in the study of sound and the instruments that transmit it.

It may well be the quietest spot in the world. For not only is outside sound prevented from entering the room, but 99.98% of all incident sound in the room is absorbed by the specially constructed, sound-trapping, saw-toothed wedges of glass wool which line the walls, ceiling and sub-floor to a depth of five feet.

The floor, unlike any other ever constructed, consists of cable only eight-hundredths of an inch in diameter which has been woven into 2" mesh. It will support a load of 5 pounds per square inch. The cables are so small that they do not reflect sound waves but permit them to go right through the floor to the sub-floor where the bottom wedges are located.

Springs play an important role in the functional efficiency of the room. For they support the floor by maintaining uniform tension of the cables. Working with Bell engineers, American Steel & Wire Company furnished extension type springs for a scale experimental model to prove the practicability of this type of floor construction. Because of their success in the scale model, U·S·S American Quality Springs were furnished for the full-sized room.

Furnishing springs for specialized applications has long been a speciality of ours. We invite you to consult with us on any troublesome spring problem you might have.

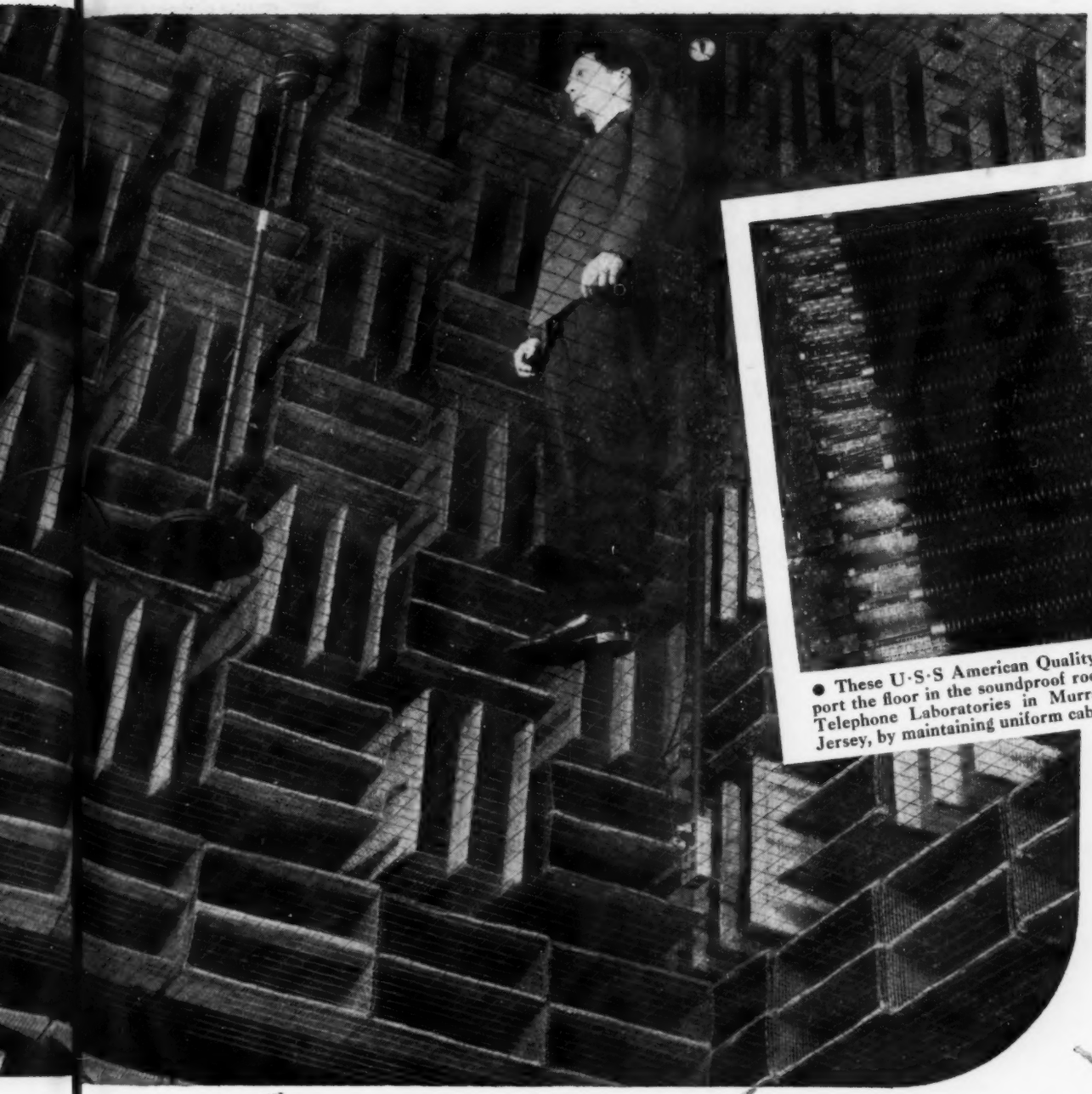
AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

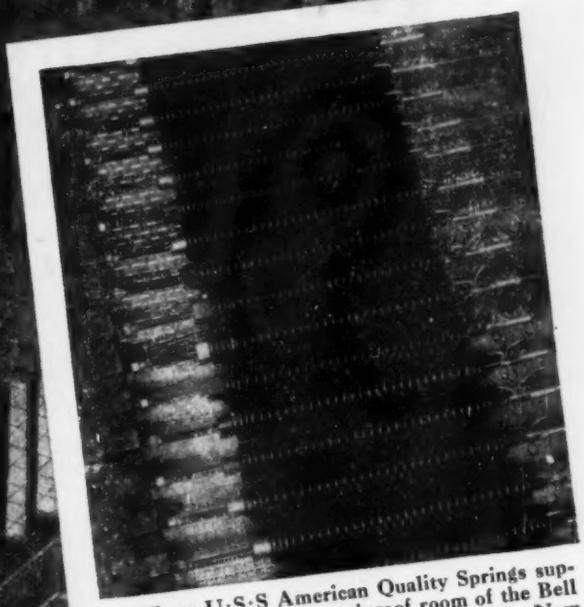
COLUMBIA STEEL COMPANY
San Francisco

Tennessee Coal, Iron & Railroad Company, Birmingham, Southern Distributors
United States Steel Export Company, New York

UNITED STATES STEEL

AMERICAN STEEL & WIRE COMPANY
USS
AMERICAN SPRINGS
UNITED STATES STEEL





● These U·S·S American Quality Springs support the floor in the soundproof room of the Bell Telephone Laboratories in Murray Hill, New Jersey, by maintaining uniform cable tension.

WHEN YOU NEED WIRE...

AMERICAN STEEL & WIRE COMPANY · USS AMERICAN MANUFACTURERS WIRE · UNITED STATES STEEL

In our modern plants with the latest kind of equipment, we can manufacture thousands of different types of wire; wire that includes Stainless Steel, Oil Tempered, Music Spring, and Heading Wire, is produced free of imperfections and drawn to your most exacting specifications. Our unexcelled research, testing, and production facilities plus over a century of wire-making "know how" are at your service.

WHEN YOU NEED COLD ROLLED STRIP...

We are the world's largest manufacturer of cold rolled strip. We produce carbon, stainless, and alloy steel strip in all commercial bright finishes with carbon strip either galvanized, coppered, tinned, or special finish. Tempered steels are made in black, scaleless, polished, and polished-and-colored finishes. At present, the demand for our high quality strip steel far exceeds the supply, but we are doing our utmost to fulfill our customers' needs.

AMERICAN STEEL & WIRE COMPANY · USS AMERSTRIP COLD ROLLED STRIP · UNITED STATES STEEL

NEW! 7½ H. P. SPINDLE DRIVE

No. 12 PLAIN MILLING MACHINE

The advance design of this new Brown & Sharpe Modern Production Tool fills a demand for more efficient, cost-saving milling in the medium-size work field. Longitudinal table feed, 24". Transverse adjustment of spindle, 4". Vertical adjustment of spindle head, 10¼". Full electrical controls make operation easy, safe, flexible. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BROWN &

MORE POWER · · · FULL 7½ H. P. TO SPINDLE

Here's a compact, versatile, manufacturing-type milling machine, similar in many ways to the 3 H.P. No. 12, but specifically powered for heavier cuts, and of ample capacity for many moderate-sized carbide milling jobs. Its power is applied through a separate spindle motor to give maximum effective cutting capacity and economy.

BROAD CHOICE OF SPEEDS AND FEEDS

21 spindle speeds, from 25 to 1790 r.p.m. in either direction (24 intermediate speeds also available) —plus 28 separate rates of *feed*, from ½" to 35" a minute. This provides more-exact selection for better adaptation to the characteristics of materials . . . and permits the most efficient milling cycle.

Other Outstanding Features

CLIMB MILLING in either direction is permitted by a built-in backlash eliminator on the table screw—released automatically during fast travel (300" per minute).

DUAL TABLE-FEED RATES (automatically or manually controlled) provide 16 feed rates from ½" to 17½" per minute which may be automatically doubled at any desired point in cutting feed, or 16 rates, from 1" to 35", which may be automatically halved . . . thereby reducing the length of the milling cycle.

AUTOMATIC REVERSE IN CUTTING FEED, with table continuing in cutting feed in opposite direction, permits rough and finish milling at one loading of work, using dual feed rate if desired.

DOUBLE FIXTURE MILLING with one set of cutters . . . conventional milling on one end, climb milling on the other . . . makes cutting practically continuous.

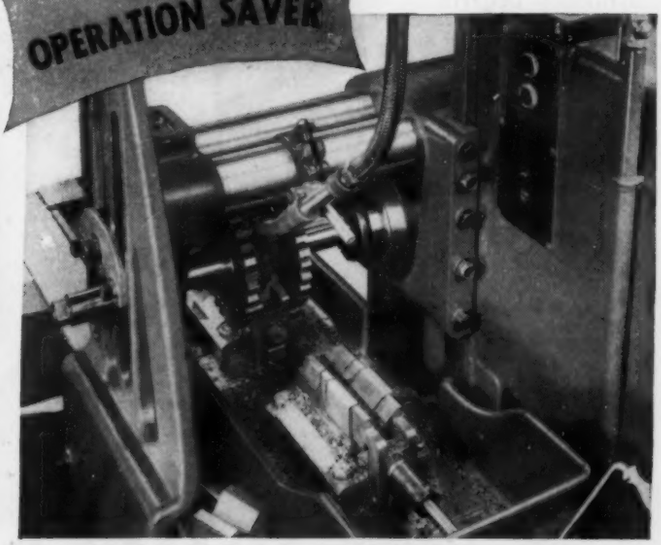
This method is extremely efficient for many classes of work.

Typical Applications

TIME SAVER

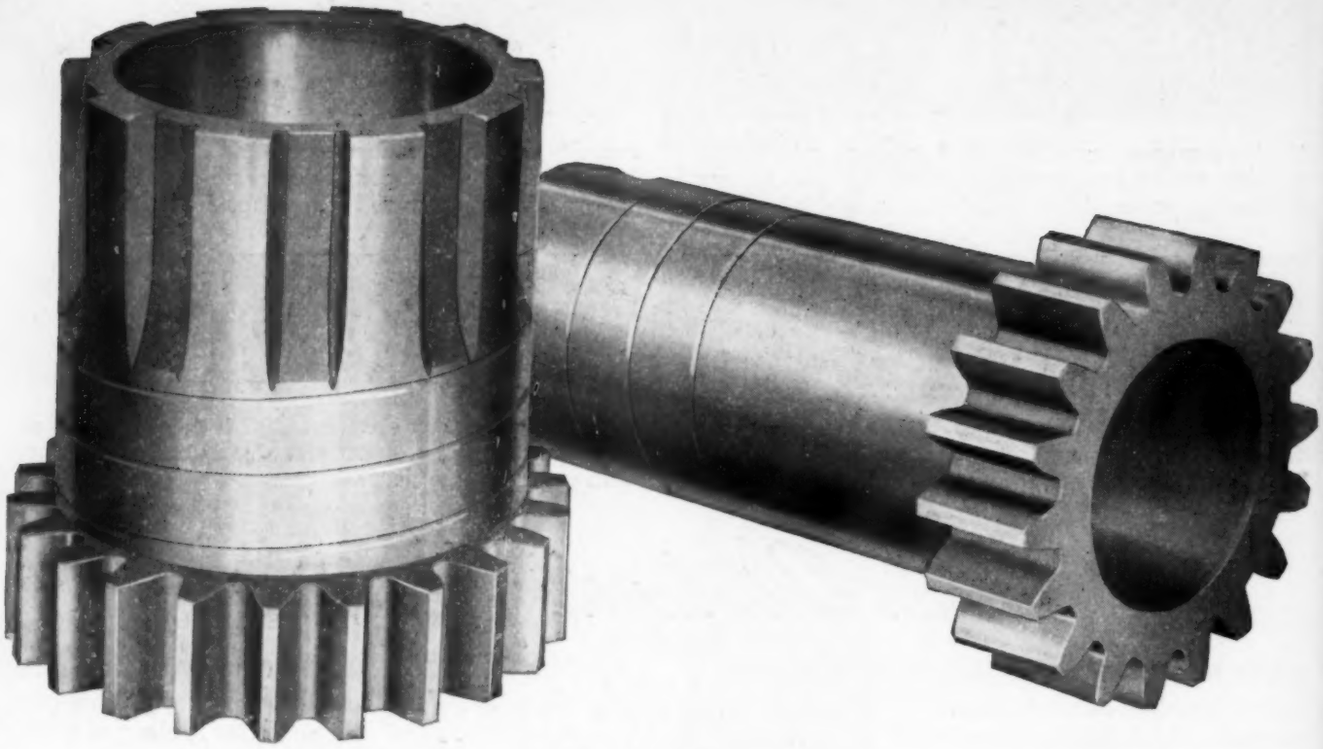
Climb milling with formed cutters simplifies this job, permitting high production, accuracy and good finish. Climb milling frequently makes possible faster feeds than with conventional milling and gives longer cutter life between sharpenings.

OPERATION SAVER



Continuous double-fixture milling, using automatic milling cycle, automatically repeated, eliminates loading time. Ample power allows several cuts to be combined in one operation—saving additional set-ups and handling.

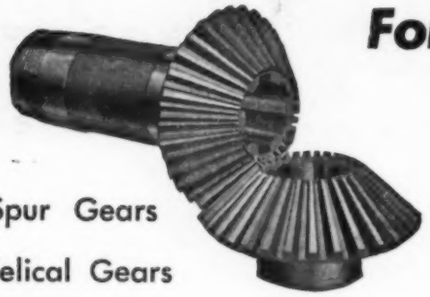
G SHARPE B·S



For Better Product Performance

Specify Adams

"TAILOR-MADE" GEARS



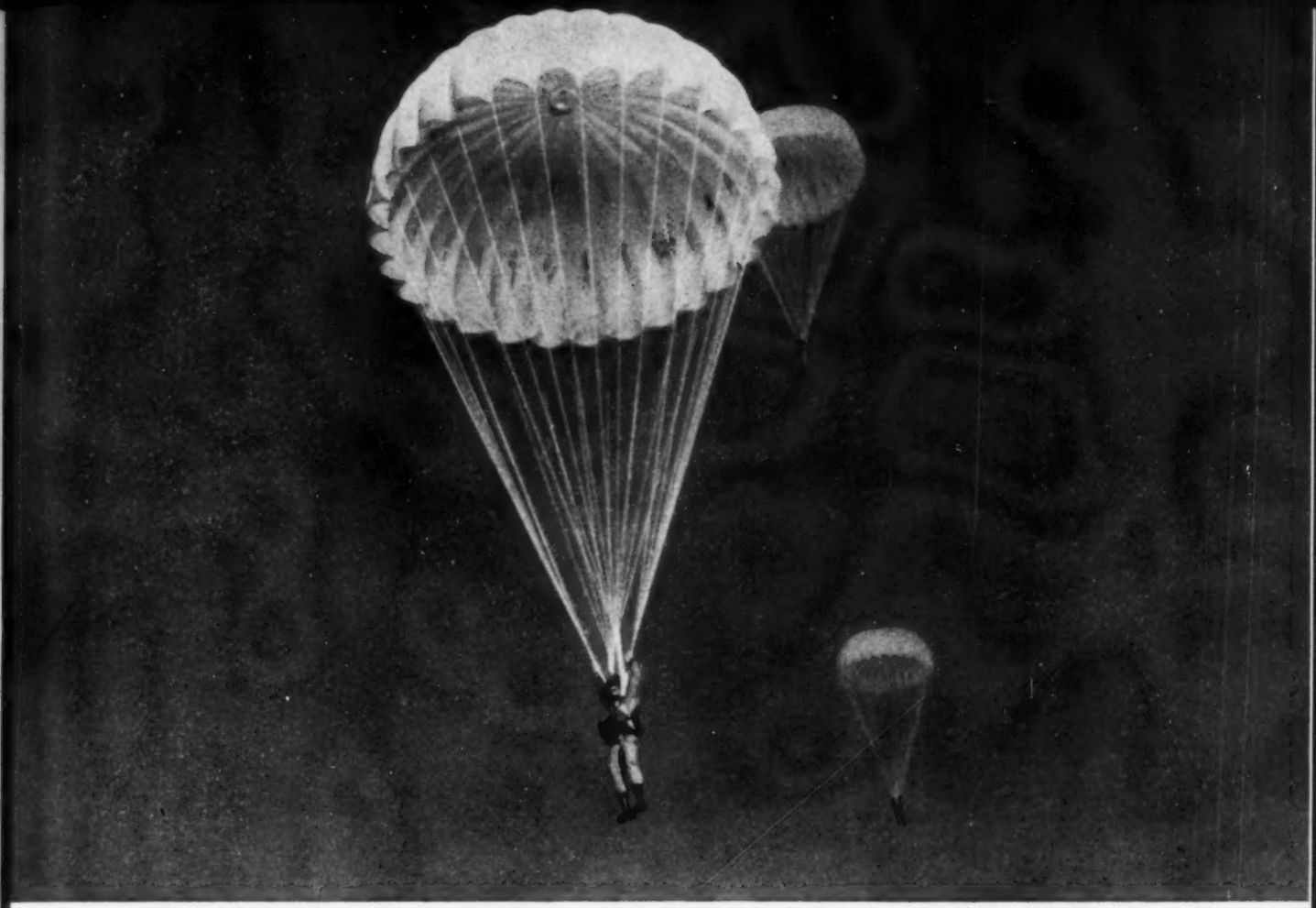
Spur Gears
Helical Gears
Splined Shafts
Worms
Worm Gears
Bevel Gears
Miter Gears
Sprockets
Ratchets
Racks
Lead and Feed Screws

When you "specify Adams" for your gear requirements, you'll get the smooth, efficient power transmission so important in improving performance standards of your product. Each Adams gear is built to close tolerances of accuracy and uniformity, especially designed for its specific job. Sixty-five years of experience in meeting industry's requirements, the constant improvement of facilities for precision manufacture, and exacting inspection and testing on modern equipment, have made us specialists in transforming your specifications into fine gears. Write for details, or consult our engineers. THE ADAMS COMPANY, 1942 Bridge St., Dubuque, Iowa.

The ADAMS Compa
Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883



There's a safe way to bring down metal working costs, too...

Plant after plant has found that costs *do* come down with Cimcool in the machines. This revolutionary new cutting fluid—this *chemical emulsion*—saves money three important ways:

1. LONGER TOOL LIFE (and therefore less down time) because of Cimcool's *chemical lubricity.*

2. FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

3. CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It isn't subject to rancidity. Its low surface tension and low adhesion to work and chips virtually eliminates carry off.

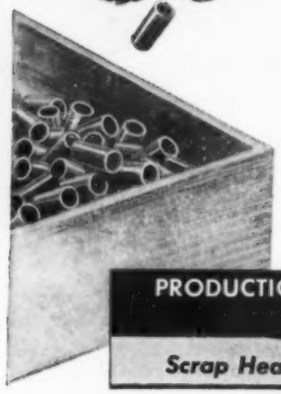
CIMCOOL DIVISION OF THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

CIMCOOL *for* 85%

Trade Mark Reg. U.S. Pat. Off.

OF ALL METAL WORKING JOBS

Did you ever sell SCRAP at a profit?



Your scrap pile holds more than metal. Its costly contents include your dead losses in time and labor operations. Seconds and rejects can only mean increased production costs all along the line.

There is an answer to this . . . . . Inspection by Dial Indicator Gaging . . . . . Stop making the parts that won't fit!

Old-fashioned gaging methods permit too much scrap loss

Dial Indicator Gaging cuts seconds and rejects to a minimum

Wherever you have a production problem involving a dimension of any kind, you have a use for a Dial Indicator Gage. And a Dial Indicator Gage for that specific job is available . . . This is the *modern* inspection method that enables workers to *see* dimensions, instead of feeling for them. You get *accuracy* — to whatever degree your work requires. Equally important — you get *speed*.

"Too big" and "too small" are no longer adequate answers for an inspection system. "Exactly how big?" and "What's causing the variation?" are the questions answered by Dial Indicator Gaging.

With selective sampling, you inspect while the parts are in production. Your control limits are set up on a Dial Indicator; the machine's tendency to exceed control limits is quickly spotted. The operator knows where he is—he adjusts the machine *before the scrap is produced.*

Two types of Dial Indicator Gages are briefly described on the opposite page. Many other types are available. We make both standard and custom-built gages to meet the needs of users in a hundred industries. For highly specialized needs, we also make Air Gages and Automatic Electronic Sorting Gages. Our collective experience is available to you — through the Federal field representative in your territory or direct from our laboratory and factory. You may save both time and money by calling upon this experience.

FEDERAL

FEDERAL PRODUCTS COPORATION

YOUR PROFIT DECISION IS *Visible** PRECISION

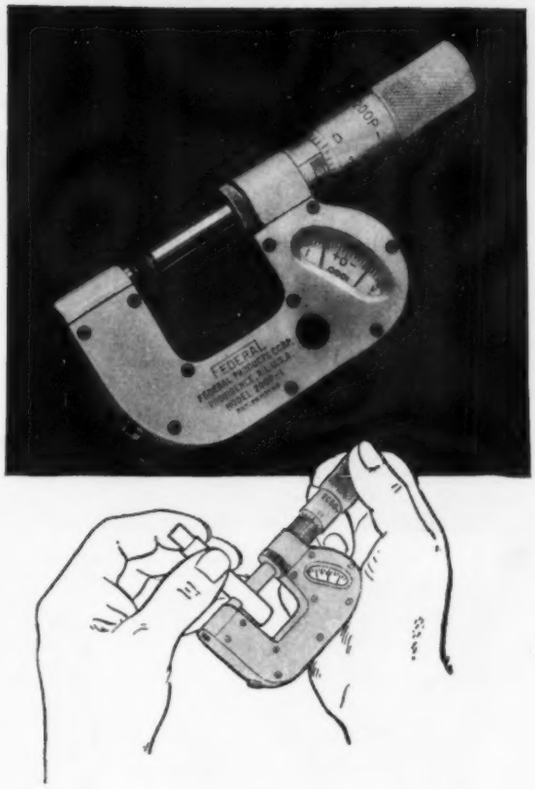
The use of Dial Indicator Gages — visible precision — lowers inspection costs, raises production. Federal Products Corporation is America's largest maker of both standard and custom-built gages — mechanical, air, electronic — for the measurement of single and multiple dimensions.

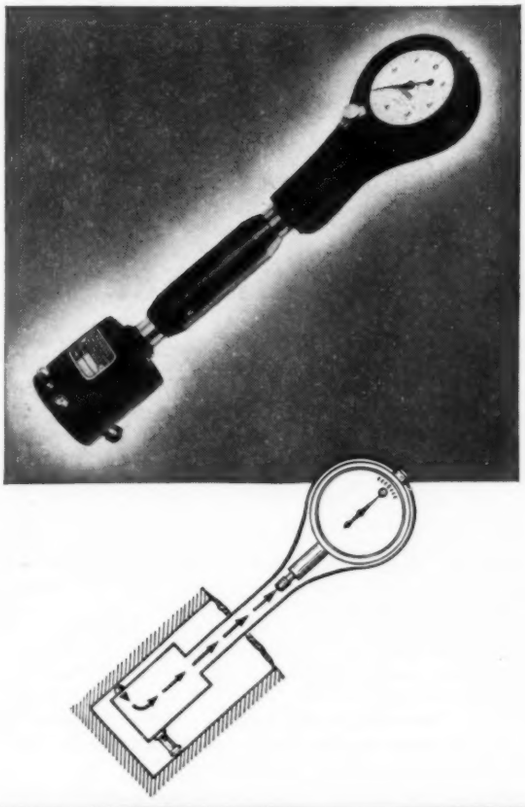
HERE — *for example*

THE DIAL INDICATOR

creates an Indicating Micrometer

This combination of micrometer and Dial Indicator permits *visual* measurement and comparison. Measurement is read instantly, without calculation; human error, from variations in pressure, is eliminated. When used as a snap-gage comparator, the Dial Indicator shows, at a glance, the variation from the standard in hundred-thousandths of an inch. This Dial Indicator Gage is adaptable to a variety of work sizes, particularly where the total volume does not justify specialized gaging equipment.





Another application

THE DIAL INDICATOR

removes the blind spot in hole gaging

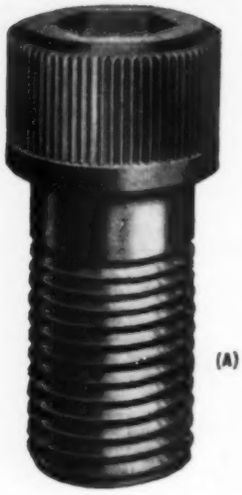
Here the Dial Indicator is employed for checking inside hole diameters. This is the successor to old-fashioned plug gaging. The Dial Indicator Gage shows — not only the acceptability or non-acceptability of the piece — but the actual amount of variation. These gages are made in both portable and bench type models — to inspect holes ranging from .122" to 12.665" in diameter. Graduated in .0001" — they are precise, positive and fast for either fine or coarse tolerances. They are much easier to use than old-style gages. Human variations are reduced to a minimum.

Write for illustrated Bulletin #21 to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

FEDERAL PRODUCTS CORPORATION **1144 Eddy St., Providence 1, R. I.**

Millions of these UNBRAKO SOCKET SCREW PRODUCTS *—are in use!*

Reg. U. S. Pat. Off.



(A)

(B) Pat'd.

(C) Pat'd.

KNURLING MAKES THE DIFFERENCE

(A) The *Knurled* head of the "Unbrako" Socket Head Cap Screw makes it slip- and fumble-proof, even if fingers and head are oily; therefore, it can be screwed-in faster and farther, before it becomes necessary to use a wrench . . . thereby helping to cut assembly costs. The "Unbrako" Socket Cap Screw may also become a SELF-LOCKER . . . ask us how.

(B) The patented *Knurled* cup point of the "Unbrako" Socket Set Screw makes it a SELF-LOCKER, because the point digs-in and *stays* dug, regardless of extreme vibration. It can be used *again and again*, in fact, any number of times.

(C) The *Knurling* of this patented "Unbrako" Socket Set Screw—as shown—swages the threads, so that it becomes a most excellent SELF-LOCKER—for use where the points such as: flat, dog, cone and oval, which cannot be knurled, are specified.

Millions of these "Unbrako" Socket Screw Products—in sizes from No. 4 to 1½" diameter, and in a full range of lengths are being used throughout industry to save assembly time, facilitate compact designs, reduce weight and costs. Ask for your copy of the "Unbrako" Catalog. As all our patented "Unbrako" Set Screws regardless of point are SELF-LOCKING, we can lock most any set screw application. We are prepared to furnish "Unbrako" Socket Screw Products in Stainless Steel.

Ask for the name and address of your nearest "Unbrako" and "Hallowell" Industrial Distributor.

Knurling of Socket Screws originated with "Unbrako" in 1934.

KITS: Pat.s Pend.

You can't tighten or loosen socket screws without a hex socket wrench, so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

Jenkintown, Penna., Box 4——Branches: Boston—Chicago—Detroit—Indianapolis—St. Louis—San Francisco

What's in
VERMONT
this month?

NEW SLIDES ELIMINATE OIL FILM BEARING. Bryant has developed a preloaded ball bearing slide for their internal grinders that is unique in both construction and performance. It comprises sleeves with rows of ball bearings that provide rolling metal-to-metal contact. It forms an extremely sensitive, yet rigid, mounting.

Two of these bearings on one bar maintain axial alignment; a third bearing on another bar gives the slide a widely spaced, three-point support. The Bryant slide resists all lateral thrust since preload is radial. This design avoids the objectionable feature of conventional slides in which the oil film causes a slight flotation resulting in slight misalignment of the members.

One slide under the workhead and one under the wheelhead eliminate a compound slide and keep the workhead and wheel near the bed of the machine for maximum rigidity.

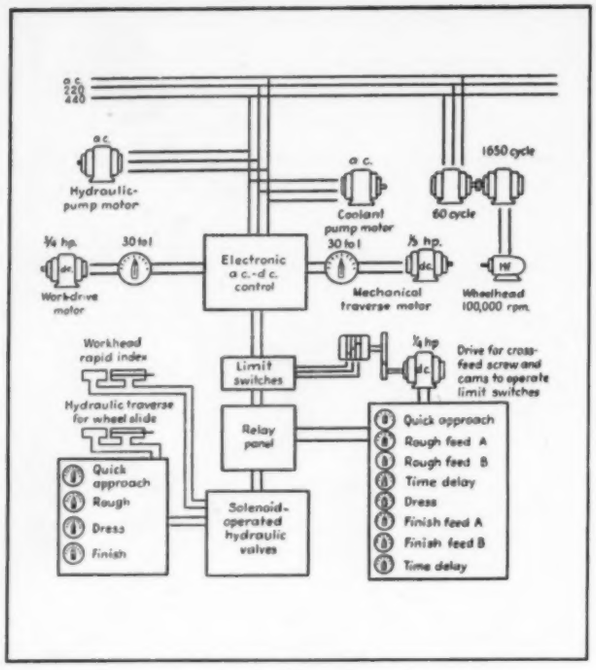
This design was planned for exclusive use on machines of the "high precision" class where a shift of 20 millionths of an inch due to oil film would result in work spoilage.

The design has proved so successful, where fast stock removal and extremely close tolerances are required, that this slide is now standard on the Bryant No. 109 Automatic.

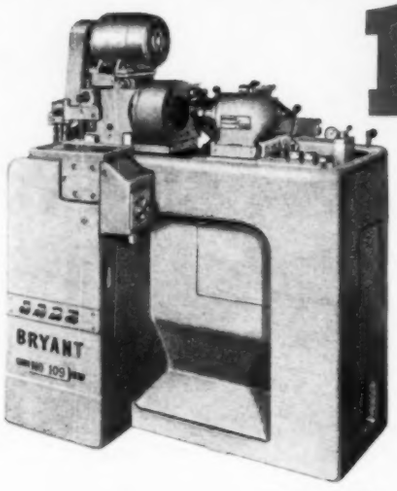
This is an example of how new basic design in modern machine tools can increase your precision production.

It won't cost to inquire.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.



BRYANT 109



AUTOMATIC INTERNAL GRINDER

The Bryant No. 109 Internal Grinder is designed for high precision production of holes from ¼ to 2½ inches in diameter. Other Bryant equipment will grind holes through the complete range up to 60 inches diameter swing. Write to the factory for full information.

SPECIFICATIONS

Total swing	9 inches
Will grind bore diameters	¼ to 2½ inches
Maximum traverse	6 inches
Maximum hole depth	3 inches
Will grind included angle	90°
R.P.M. of work spindle	200 to 2,400 R.P.M.
Net weight	3,000 lbs.
Floor space — 62 inches x 52 inches (with coolant tank)	

SLIDES
Preloaded ball slides for both cross and longitudinal motion.

WORKHEAD
Ball bearing spindle, variable speed electric drive, 200 to 2,400 R.P.M.

WHEELHEAD
Precision ball bearing wheelhead with built-in high-frequency electric motor — speeds up to 100,000 R.P.M.

TRAVERSE
Hydraulic — 4 stations in automatic cycle, each variable — see drawing.

CROSS FEED
Eight variable stations in automatic cycle — see drawing.

POWER
Machine operates from standard AC current.

BRYANT INTERNAL & EXTERNAL THREAD GAGES. Bryant thread gages are made in three standard models for the fast, accurate, visual inspection of threaded parts. These models cover the range from ⅜" to 5" internal, and 3/16" to 5" external. Write for Catalog No. G for details.

You can *"See the Difference"* with a BRYANT GAGE

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

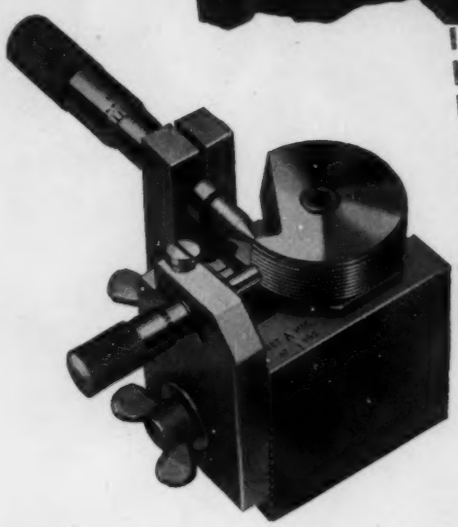
At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

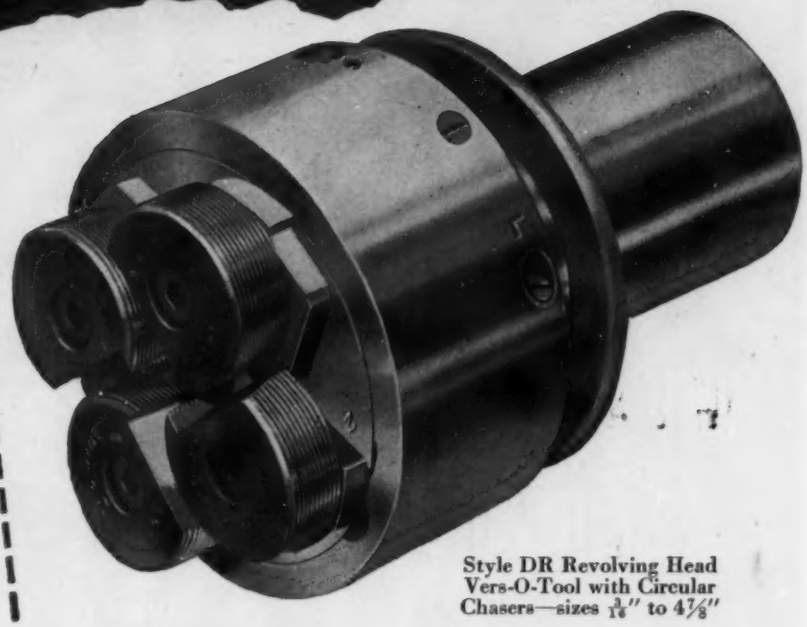
Send samples or drawings for a complete story on how Bryant can save inspection money for you.

Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.

INCREASE YOUR THREADING PROFITS *with this* VERS-O-TOOL *team*



Namco Micrometer Gage Insures Identical Regrinds on Vers-O-Tool Circular Chasers



Style DR Revolving Head Vers-O-Tool with Circular Chasers—sizes $\frac{3}{16}$" to $4\frac{7}{8}$"

EXCLUSIVE VERS-O-TOOL FEATURES

- ★ **Simple head with fewest parts, hardened and ground throughout; one screw gives quick adjustment to size.**
- ★ **Ground-thread circular chasers for high precision and long life.**
- ★ **Micrometer gage control for regrinding.**
- ★ **Chasers interchangeable, size for size, in revolving and nonrevolving heads.**
- ★ **Hollow milling cutters for end forming and turning; you get double duty from Vers-O-Tools.**

Positive micrometer checking—before and after grinds—insures that your first piece will be production. There's no cut and try, for size—no scrap loss.

Vers-O-Tool Circular Chasers, regrindable through a full 270°, last 10 to 20 times longer.

These Vers-O-Tool advantages—savings in time, materials and chaser costs—can "up" your threading profits. May we furnish more detailed literature?

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

WINTER BROTHERS TAPS ARE DEPENDABLE

Winter Taper Pipe Taps are designed to provide the close tolerances essential in tapping pipe fittings. Like other Winter Taps, they give you cleaner threads, longer service between grinds, and extra tap life.

Always at Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter Taps on his shelves—as close to your tapping problems as the telephone on your desk.

● When you buy Winter taps, you get more than a fine tool. Competent, trained Winter Engineers are at your call from stations throughout the country. These men can draw upon the accumulated knowledge of the entire Winter organization—close to a half century of tapping experience—in answering your questions. Call on your Winter Engineer whenever a troublesome tapping problem may arise.

Winter Brothers COMPANY

ROCHESTER, MICH. and WRENTHAM, MASS. • Distributors in Principal Cities

A Division of the National Twist Drill and Tool Company • Branch Stores: San Francisco, Chicago, Detroit

WINTER

PERFORMANCE IS BUILT INTO NATIONAL METAL CUTTING TOOLS

HEAT TREATMENT

National Counterbores are noted for their rugged construction, simplicity of design, and adaptability to a wide variety of operations. The complete National line also includes Twist Drills, Reamers, Milling Cutters, End Mills, and Hobs.

● Scientifically exact heat treatment is an important factor that assures you better performance from National metal cutting tools. At the new National plant, this critical step in quality tool manufacturing is closely controlled and safeguarded by the use of the best equipment obtainable. This applies to furnaces as well as to time and temperature controls. No important operation relies on the human element.

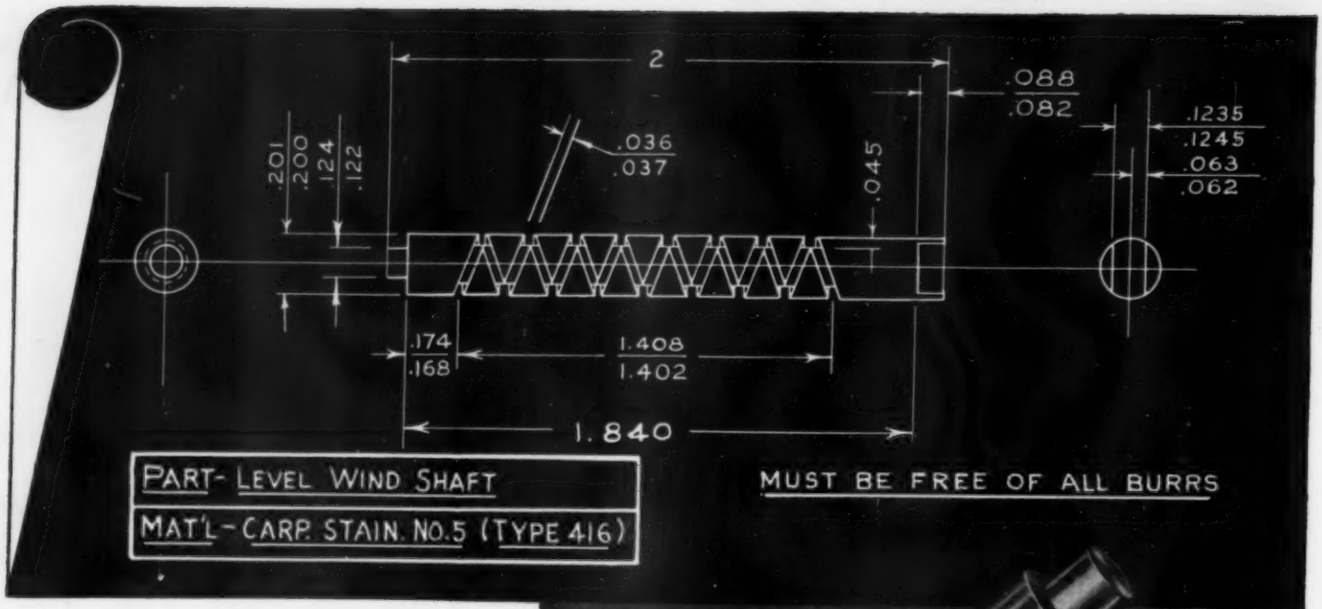
Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

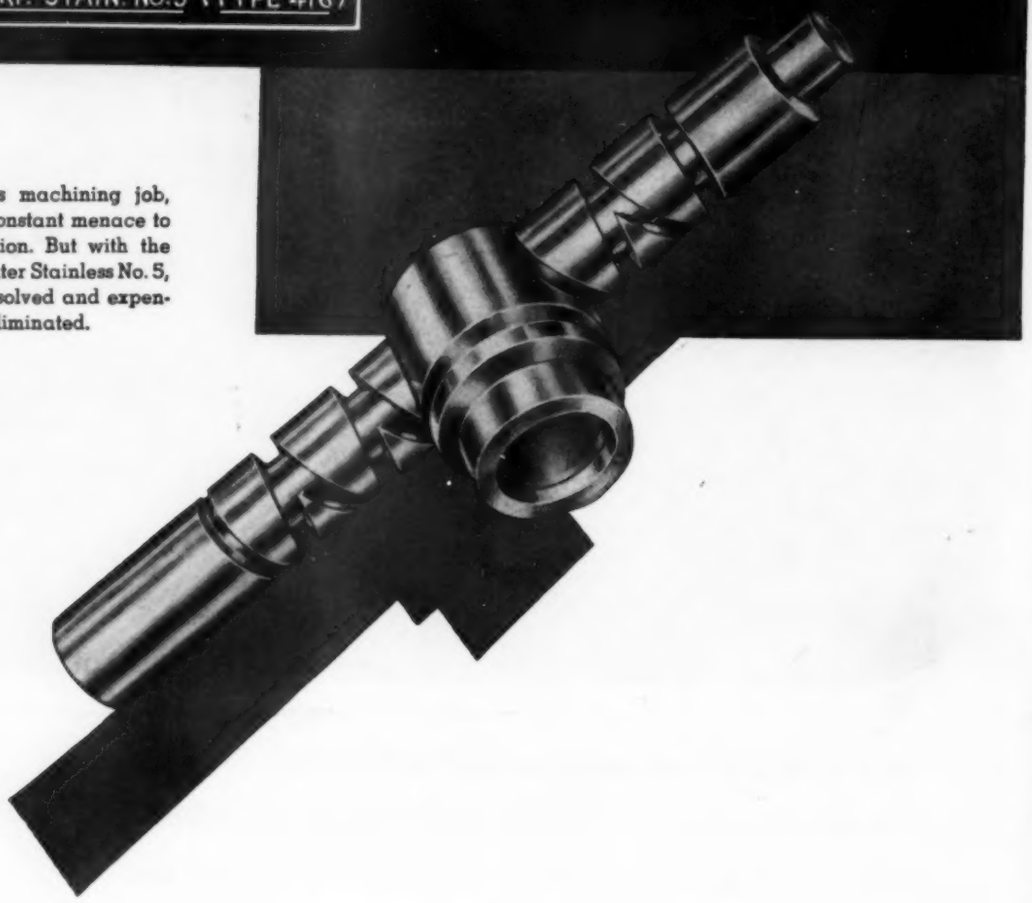
NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division—Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco



On this Stainless machining job, burring was a constant menace to low cost production. But with the change to Carpenter Stainless No. 5, the problem was solved and expensive hand work eliminated.



You can turn it out

at less cost

with Carpenter Free-Machining Stainless!

more than corrosion resistance

Available for fast shipment from stock

To cut down on the amount of time and money you put into each job, take advantage of this Carpenter service for Stainless users.

1 For practical tooling and production information, use the Carpenter "Notebook on Machining Stainless Steels." It contains over 90 pages of drawings, tables and technical information on turning, drilling, reaming, tapping, threading, etc. The NOTEBOOK is available to Production and Engineering executives. Just write a note on your company letterhead.

here is a way to REDUCE UNIT COSTS on your Stainless Machining Jobs

2 When a new job is in the planning stages, it is time to take advantage of Carpenter's experience with Stainless and its fabrication. We can take immediate steps to help you keep production costs in line.

3 In hundreds of plants, engineering and production executives have proved that one of the best ways to be sure of the lowest possible unit costs is to specify *Carpenter* every time a Free-Machining Stainless bar stock order is placed. And that is just natural, for it was in Carpenter's laboratories that the first Free-Machining Stainless was invented many years ago. To get the results you want with Free-Machining Stainless, call your nearest Carpenter warehouse or distributor. You will get fast delivery of your order.

THE CARPENTER STEEL COMPANY, 109 W. BERN STREET, READING, PA.

Carpenter

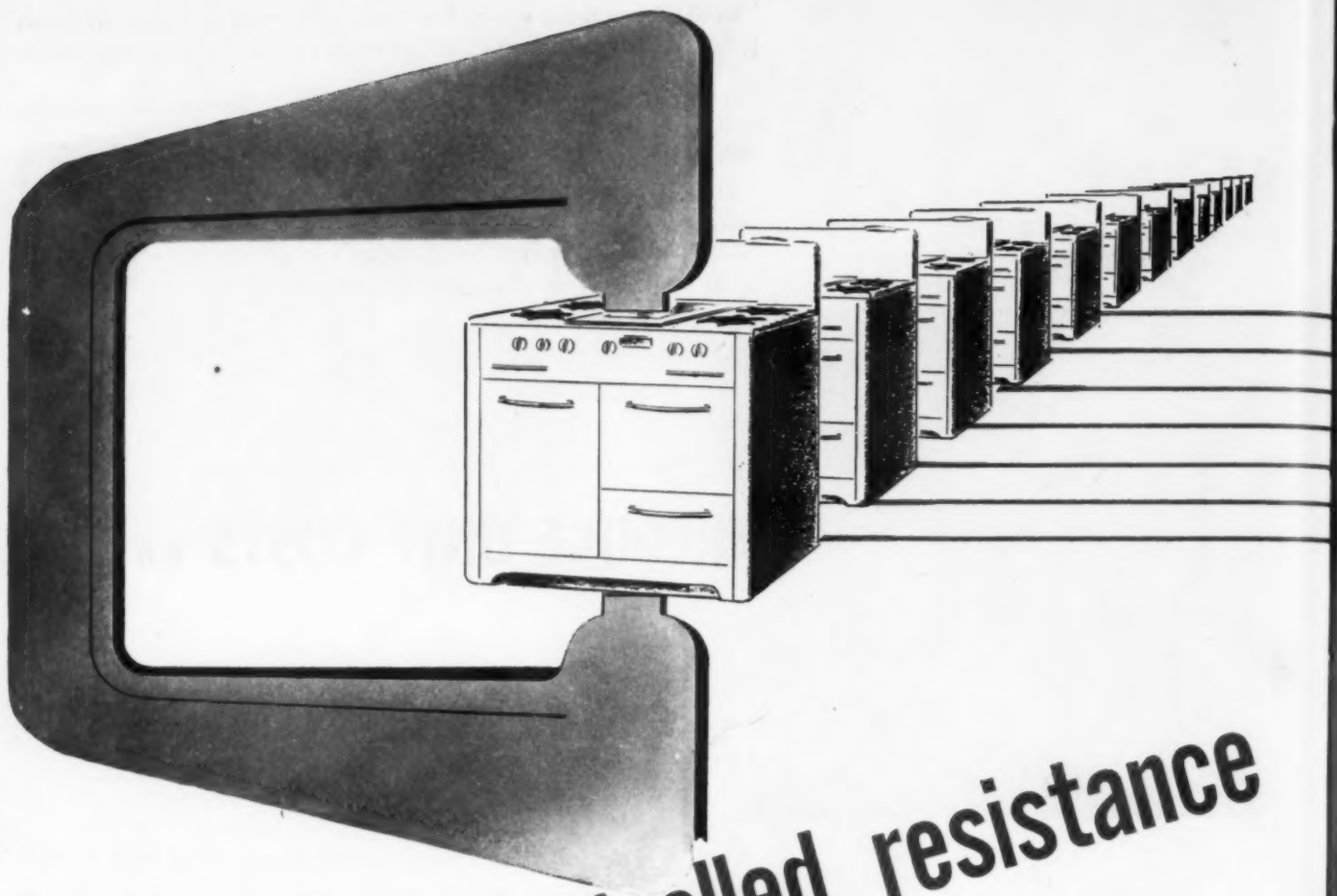
FREE-MACHINING

STAINLESS STEELS

Call your local Carpenter Warehouse or Distributor

Branches: Boston • Bridgeport, Conn. • Buffalo • Chicago • Cincinnati • Cleveland Dayton • Detroit • Hartford • Indianapolis • Los Angeles • New York • Philadelphia Providence • St. Louis • Worcester, Mass.

SEE THE CLASSIFIED SECTION OF YOUR TELEPHONE DIRECTORY



with controlled resistance

THE JAMES GRAHAM MANUFACTURING COMPANY of Newark, California, manufacturers of the "Wedgewood Gas Range," says, "Replacing the non-electronic control on our gun welders with General Electric's electronic controls has

- improved our quality of work, because with electronic controls, the possibility of human error has been substantially reduced,
- reduced our maintenance costs by eliminating breakdowns and outages,
- increased our production about five per cent."

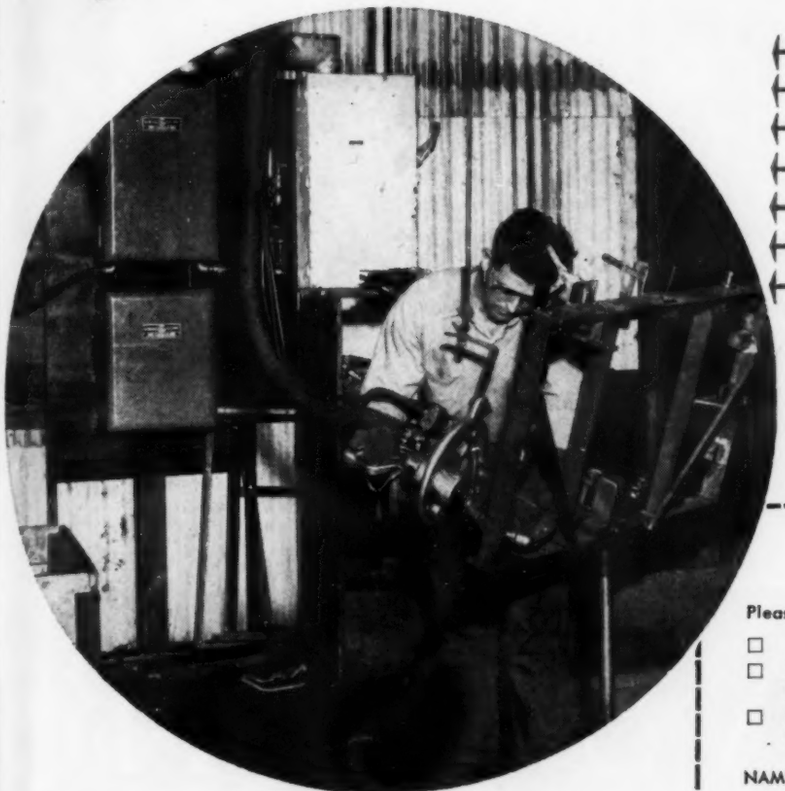
G-E ELECTRONIC CONTROL IS EXCELLENT BECAUSE: it controls the entire welding operation precisely and automatically with a minimum of moving parts. This relieves the operator of guesswork, and assures faster, more consistent welding.

Resistance welding is improving production in all kinds of plants. See some of these time- and money-saving applications in General Electric's full-color movie, "This is Resistance Welding." Your nearest G-E office, local utility, or welding machine manufacturer will be glad to arrange a free showing for you. And for free descriptive literature on G-E electronic controls, mail the coupon to us.

BETTER WELDS FASTER · electronic controls by

"better quality less maintenance"

welding



Spot welding the frame of a James Graham Mfg. Co. Wedgewood Gas Range

Apparatus Dept., Sec. B645-45
General Electric Company
Schenectady 5, N. Y.

Please send me the following bulletins:

- ☐ The Importance of Control, GEA-4571
- ☐ Synchronous Control for Spot and Projection Welding, GEA-4699
- ☐ Nonsynchronous Control for Spot and Projection Welding, GEA-4726

NAME .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

GENERAL ELECTRIC

Want to reel in lower grinding costs?

Are you fishing for ways to cut overhead or improve production in your grinding department?

Are wheel wear, dressing time and expense, wheel loading or slow stock removal eating into your profits?

Then Peninsular engineers can help you. Let them give your grinding a complete check up, *at no cost to you.*

They'll make a thorough study of your machines, your grinding methods, the materials you grind. Only after this exhaustive analysis has been made will they make their suggestions and recommendations.

This Peninsular on-the-grounds analysis is the chief reason Peninsular *custom-made* wheels have helped bring in savings for manufacturers in almost every industry during the last sixty years.

May we have one of our engineers call on you?

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

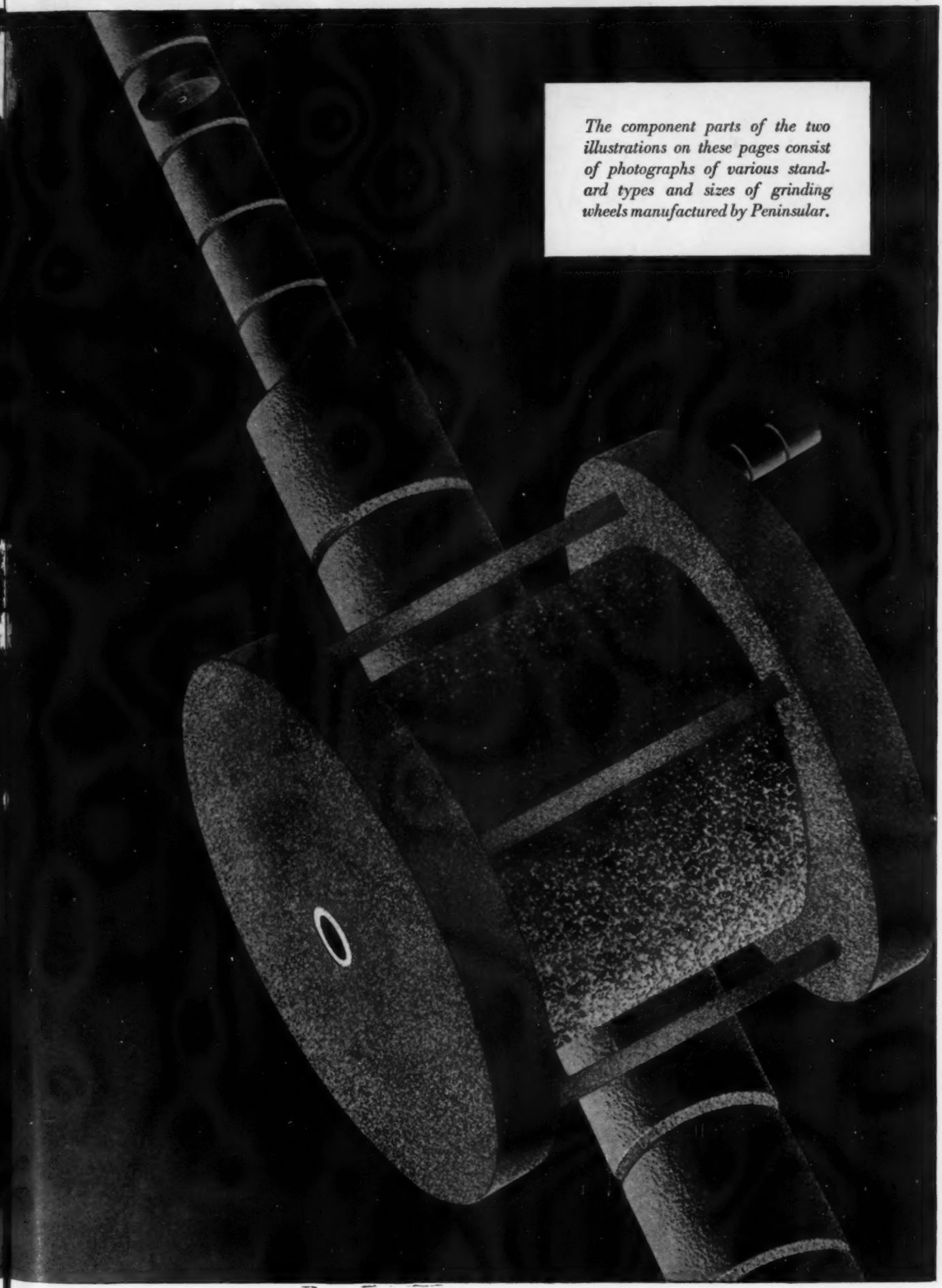
PENINSULAR

INDIVIDUALLY PENINSULAR ENGINEERED

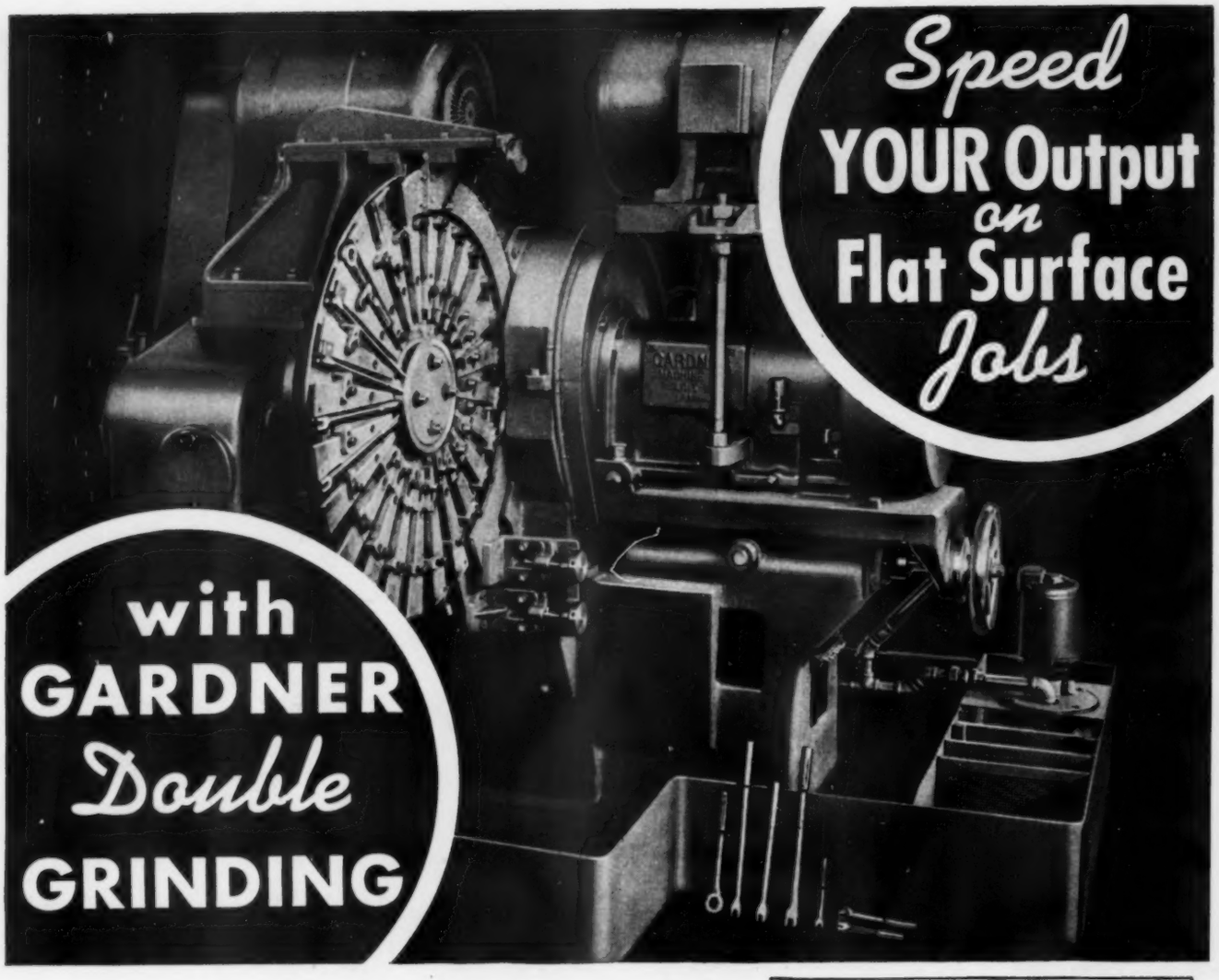
GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



The component parts of the two illustrations on these pages consist of photographs of various standard types and sizes of grinding wheels manufactured by Peninsular.



Speed YOUR Output on Flat Surface Jobs

with GARDNER Double GRINDING

GARDNER Double GRINDING is solving many parallel-surfacing problems, such as the wrench handle job shown here. Most of these grinders are literally semi-automatic in operation, hence production normally is high.

This No. 120A-26" GARDNER *Double* GRINDER is equipped with a universal type rotary carrier that is adjustable to handle several sizes of wrenches. TWO sides are ground with ONE pass through the machine, at the rate of 15 to 25 per minute.

You can parallel-surface dozens of parts, large or small, — with a GARDNER Double GRINDER.

WORK DATA

Part *Wrench Handles*
Material *Steel Forgings*
Operation *Grind Two Parallel Sides*
Tolerances *.002" for Parallelism; .002" to .004" for Uniformity*
Stock Removal *.040" Maximum Overall*
Production *15 to 25 Per Minute Depending on Size*
Feed *Hand Load & Unload*
Machine *#120A-26" Gardner Double Grinder*

Write for Latest Bulletin on Gardner DOUBLE Grinding!

GARDNER - GRIND YOUR *Flat* SURFACES

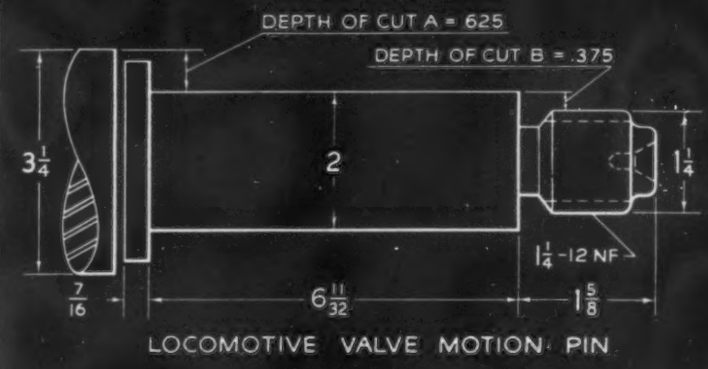
GARDNER MACHINE COMPANY

410 East Gardner Street . . . . Beloit, Wisconsin, U.S.A.

YOU CAN CUT YOUR TURNING COSTS WITH JONES & LAMSON LATHES—

because

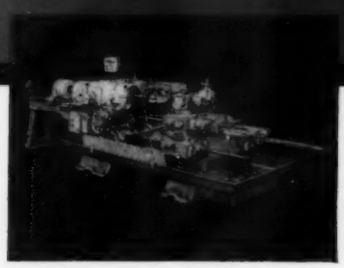
they have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively.



LOCOMOTIVE VALVE MOTION PIN

Take this locomotive part for instance...

Another typical example of effective power turning with carbide tools on a Jones & Lamson No. 7A-5 Saddle Type Turret Lathe. Cut "A" produces the 2" diameter from 3¼" X-1315 bar stock at 220 FPM and .022" Feed. The total power required approximates 22 HORSEPOWER! Turn "B" produces the 1¼" thread diameter at a surface speed of 275 FPM and .022" Feed. The total power requirement approximates 17 HORSEPOWER. The complete valve motion pin is machined as shown, in 5.8 minutes floor-to-floor time — twice as fast as with high speed steel cutting tools.



YOU CANNOT COMPETE with production like this with machines less powerful, less rigid.
Jones & Lamson Lathes guarantee your investment.
***They anticipate* the future in metal turning.**
***They are built* with great reserves of ruggedness.**
***They are powered* to meet even more than today's requirements for the effective use of carbide tools.**
Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

Jones & Lamson Lathes

ARE POWERED FOR CARBIDE

ARMSTRONG

ARMALOY

Drop Forged

WRENCHES

ARMSTRONG ARMALOY — Wrenches are NEW. They are designed to meet the requirements of the mechanic who knows his tools and insists on using tools of Superior Quality.

ARMSTRONG ARMALOY — Wrenches are made from selected grade alloy steel. They are longer, lighter, thinner, yet stronger than the conventional alloy wrenches—heat treated to exact specifications of stiffness and tensile strength—better balanced, hence easier to use. Finished in chrome plate with heads buffed bright.

Armstrong Tools are stocked by leading tool departments.

Combination

Box Socket

Construction and Structural

Hex Box

Reversible Ratchets

Detachable Sockets and Sets

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People."

5215 W. Armstrong Ave. Chicago 30, Ill.

This company is taking advantage of the productive capacity of this . . .

New Series 62" KING VERTICAL BORING AND TURNING MACHINE

● Note how all three heads are working simultaneously on the steel casting shown. The left-hand head is facing the lugs, an intermittent cutting operation, the right hand head is boring the center hole, and the side head is performing a turning operation.

The increased weight—the new massive rectangular type rams—the eight bearing surfaces on the rams with four adjustable gibs provide the rigidity necessary to handle this type of operation on steel castings as well as the successful use of carbide tools.

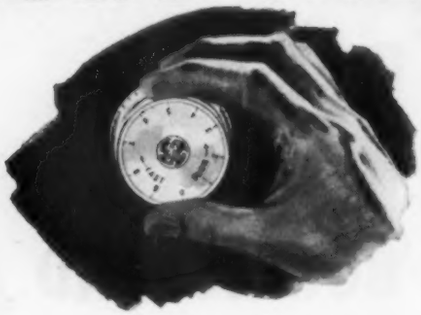
Another cost saving advantage is the convenient controls—all operating levers being located at the front for ease of operation. *Investigate the New Series KING Line for precision operation and ultimate economy.*

American Steel Foundries

KING MACHINE TOOL DIV.
CINCINNATI 29, OHIO

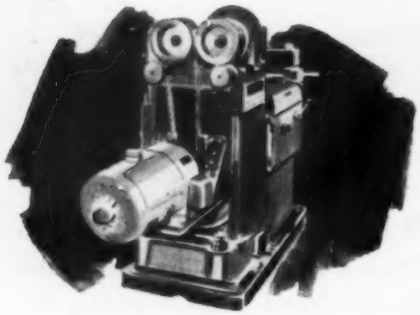
Builders of Vertical Boring and Turning Machines and Sebastian Lathes

dial any speed . . .



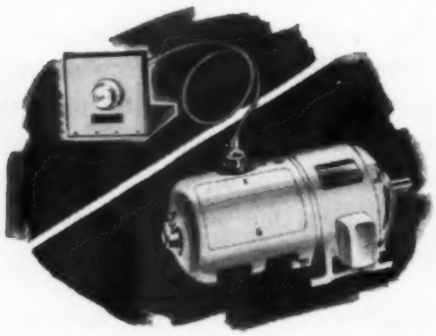
At the twist of a dial, the new Tri-Clad Type ACA induction motor will operate at any speed over a 3 to 1 range! What's more, it will do it while running on alternating current — without any converting equipment or mechanical devices whatsoever. It changes speed quickly and smoothly. In fact, wherever an adjustable-speed drive will improve quality or quantity of output, the Tri-Clad Type ACA induction motor is a simple, economical solution.

for any machine . . .



The list of applications to your right is only a glimpse at the hundreds of potential uses where this new Tri-Clad adjustable-speed motor might well be considered. Its simplicity and ease of Installation make it an easy motor to fit to the job. Standardized NEMA dimensions are used so *there are no new mounting problems.* Its overall length is only slightly more than a constant-speed motor of comparable rating. And for the work it does, the Type ACA is one of the lightest motors in its field.

from any location!



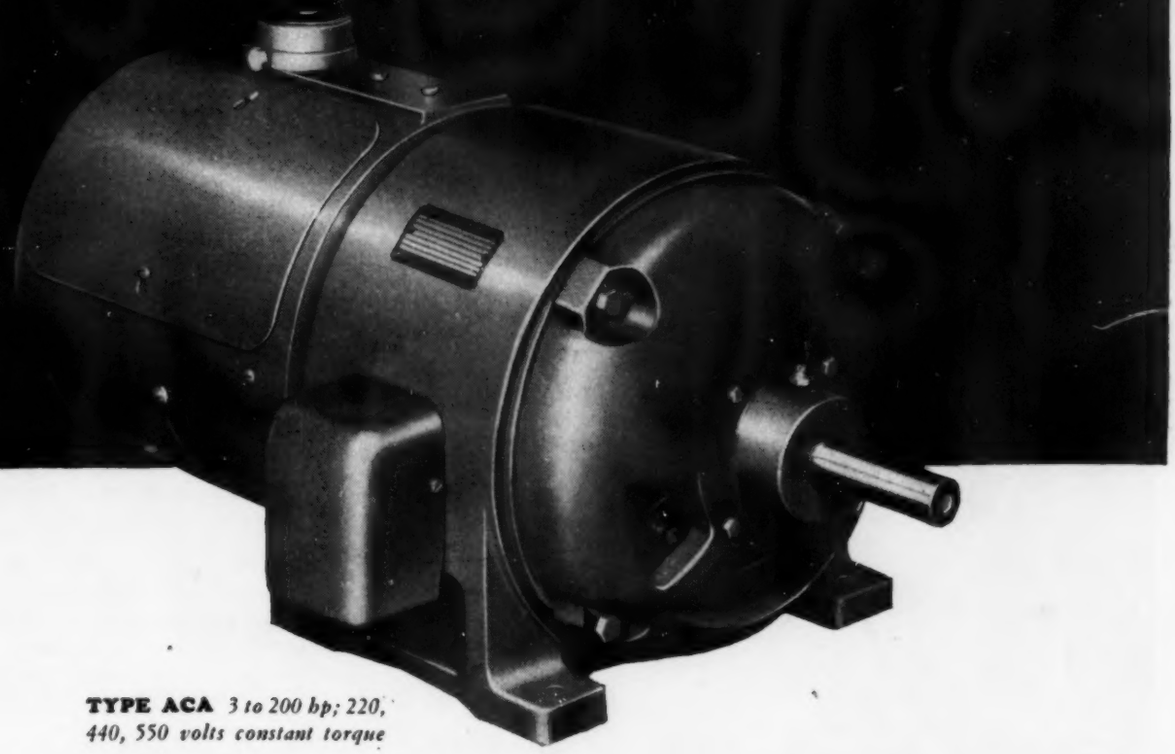
There are few limitations on your choice of location for this Tri-Clad motor, at the present offered in dripproof construction. Famous Tri-Clad construction gives it a sturdy frame for *extra protection* against physical damage; improved winding insulation for *extra protection* against electrical breakdown; and rigid bearing mountings with easy-to-lubricate bearings for *extra protection* against operating wear-and-tear. For remote control, a flexible cable or pilot motor is available. For more information, write today for Bulletin GEA-4883. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

THE NEW TRI-CLAD A-C MOTOR

REG. U.S. PAT. OFF.

with 3 to 1 speed range



TYPE ACA *3 to 200 hp; 220, 440, 550 volts constant torque*

HERE'S WHERE TO USE IT!

Textile
- Slashers
- Knitting machines
- Individual finishing machines
- Spinning frames
- Weaving machines
- Printing machines

Chemical
- Shakers
- Grinders
- Pulverizers
- Mixers
- Liquid pumps
- Solids pumps

Food
- Ovens, dryers
- Mixing machines
- Labeling machines
- Grinders
- Centrifugal machines
- Conveyors
- Shaker Screens
- Pumps

Printing
- Job presses
- Coating machines
- Trimming machines
- Stitching machines
- Rotary web presses

Paper
- Winding machines
- Slitters
- Supercalenders
- Coating machines
- Waxing machines
- Embossers
- Other converting machinery
- Stock preparation machinery
- Conveyors

Metal-Working
- Drawbenches
- Lathes
- Stamping presses
- Milling machines
- Grinders

Mining
- Mill feeder drives
- Crusher feeder drives
- Sinter conveyors
- Other conveyors

You can't beat Tri-Clad Extra Protection!

GENERAL ELECTRIC COMPANY, Section H750-293
Apparatus Department, Schenectady 5, N. Y.

Please send me Bulletin GEA-4883 which describes the new Tri-Clad Type ACA motor:

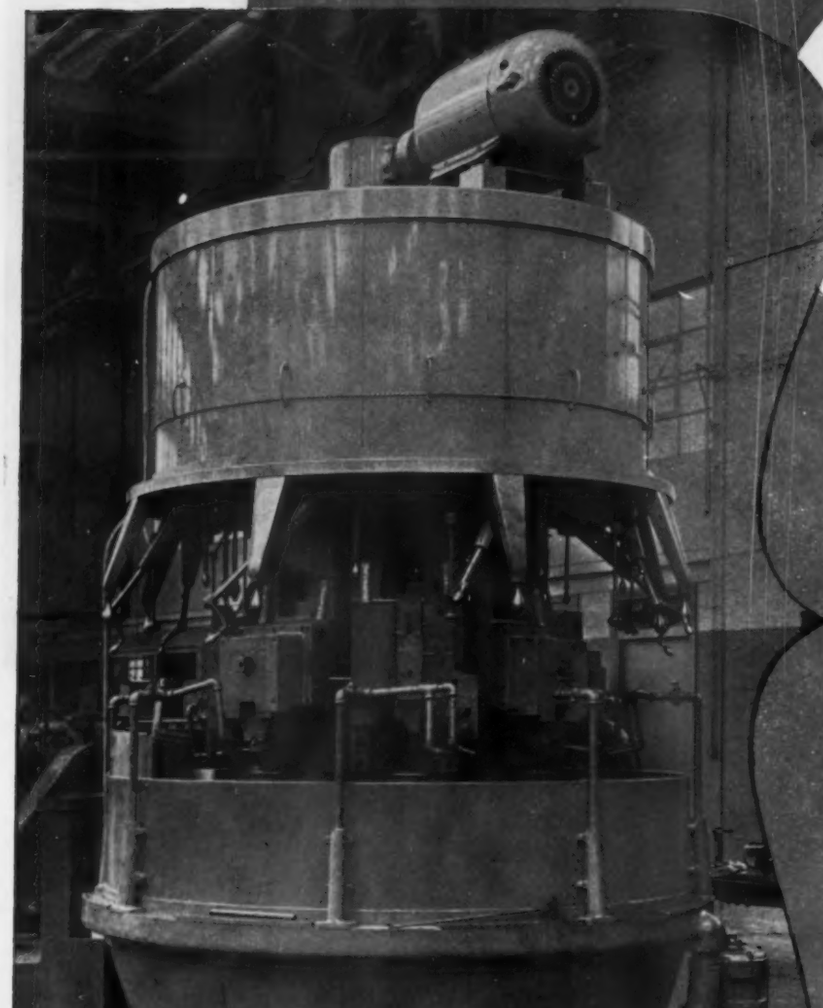
NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

A BULLARD Type D 8-Spindle Mult-Au-Matic in the up-to-date plant of the Standard Motor Co., Coventry, England. Note the compact, space-saving design.



Photographs courtesy of the Standard Car Review

ACCORDING TO A LEADING BRITISH AUTOMOBILE MANUFACTURER

"This one machine equals the production of twelve to fourteen capstan lathes."

So reports the *Standard Car Review*, published by the Standard Motor Co., Ltd., of Coventry, England. Featuring the BULLARD Type D Mult-Au-Matic as "an excellent example of modernization of production machinery", the magazine emphasizes the BULLARD machine's ability to perform 12 machining operations —entirely automatically—in 2 minutes! . . . Many similar case histories show why Mult-Au-Matics are internationally recognized as key factors in the present world-wide effort to increase production volume while cutting time and costs.

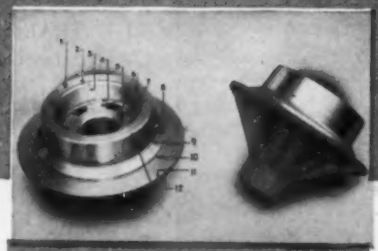
GET ALL THE DETAILS

BULLARD Type D Mult-Au-Matics—made with 6 or 8 spindles in 4 sizes, for work up to 23" diameter—are designed for high speed, heavy feed, tough metal, maintained accuracy. Type K handles small and medium-sized jobs in cast iron, steel and light metal alloys, at spindle speeds up to 900 rpm. Both types are equally effective on diversified schedules or as special purpose machines for long runs.

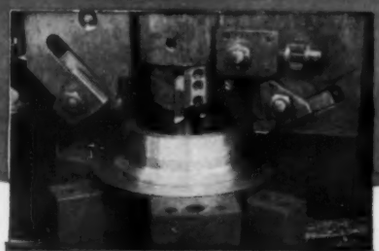
BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

BULLARD

The work. A cast differential gear case, before machining.



The same casting after completing one cycle (through 7 work stations) on the BULLARD machine. Arrows indicate the 12 machined faces . . . Piece time: 2 minutes!



Close-ups of one of the 7 automatic work stations, showing several tools cutting simultaneously.

A new and better approach

to hobbing costs

BARBER COLMAN "*MULTITHREAD*" HOBS

To combine accuracy with high production and economical tool life often is a real problem in gear cutting. Machine cycle time has been reduced to a practical minimum, and so this problem centers around the cutting tool, or hob.

Barber-Colman "*Multithread*" Hobs have now been developed to the point where they represent a real solution to the problem on certain classes of work. An example of the increased machine efficiency obtained is this 14 pitch helical gear which is semi-finished in 2 minutes with Barber-Colman Ground Class A "*Multithreads*".

The reason for this high rate of production is found in the application of the multiple thread principle by which the work indexes at a faster speed which is in a direct ratio to the number of threads in the hob. Pre-shaving tolerances are easily maintained.

JOB FACTS

Operation—Hob 14 Pitch Helical Gears, 6 per Load
Machine—Barber-Colman No. 8-10
Hob—Barber-Colman Ground Class A "*Multithread*" Hob
Material—SAE 5140 80-81 R.B.
Feed—.073"/Rev. of work
Speed—150 RPM
Floor-to-Floor Time—13 minutes per load of 6
Accuracy—Lead held within .0005", kick-out .0005", measured over balls .004" dia.

These results show the average experience with customers now using "*Multithread*" Hobs. However, in every case these tools must be accurately mounted on the hob spindle and machine conditions must be good.

These hobs may be your answer for increased productivity. They should be ordered by consulting a Barber-Colman Representative for a comprehensive analysis of your job.

Barber-Colman Company

GENERAL OFFICES AND PLANT 184 LOOMIS ST., ROCKFORD, ILL.

BARBER COLMAN — MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

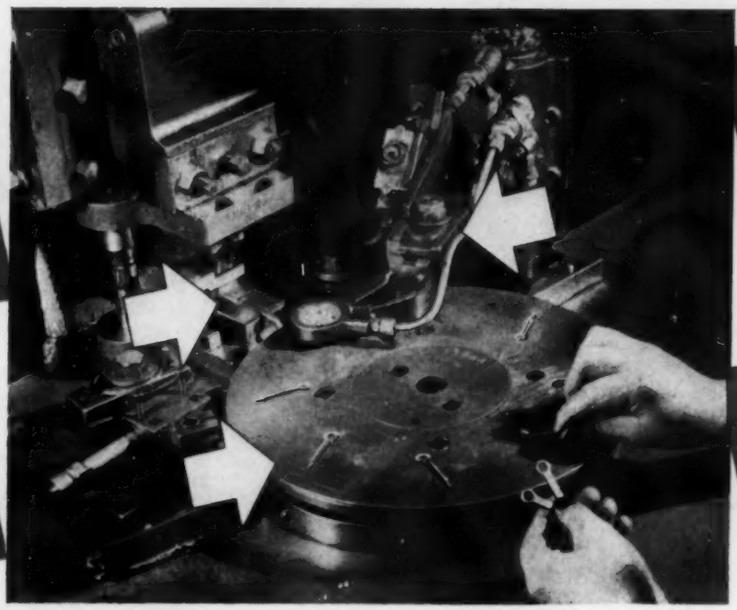
DEVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

450 FAIR AVE., FERNDALE 20, (DETROIT) MICH.

REPLACE HAZARD WITH SPEED

in punch press production with the FEED-O-MATIC


Press is automatically tripped only when piece is properly seated in die.
Moving arm feeds work to the die automatically.
Nest plate indexed, revolves automatically.
The operator's hand is never under the punch.

50 to 200% production boost

is common where the Feed-O-Matic press feeder replaces manual feeding for secondary operations. The Feed-O-Matic eliminates *all* operator hazard, replaces foot-treadle press tripping with fast, automatic tripping, and steps up production to the increased speed with which the operator simply—and safely—drops each piece into its nest in the rapidly rotating "stop-and-go" nesting plate.

The Feed-O-Matic saves dies too. First, by placing work in the die with *undeviating accuracy*, preventing wear on edges; second, by *refusing to trip the press* unless everything is *right* for the descent of the punch, averting costly tie-ups due to damaged dies and presses.

The Feed-O-Matic can be applied to almost any press, needs no special dies, and can be set up for new work in an hour or less.

GET THIS NEW BOOK

telling how and why many manufacturers are finding unforeseen production possibilities with lower all-round costs, in their punch press departments. Write today for the Feed-O-Matic book.

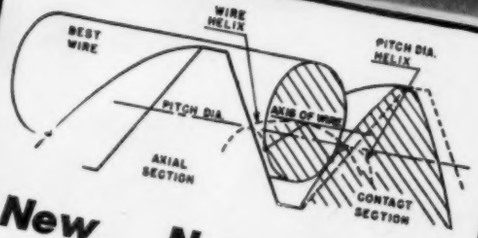
COVERT MFG. CO.

P.O. BOX 778-A **TROY, N. Y.**

Van Keuren MEASURING WIRES

STANDARD EQUIPMENT... ...everywhere

Measuring the pitch diameter of a 1"-8 National Form thread gage. This method is recommended by the Bureau of Standards.



New New New
NEW CONCEPTIONS
NEW FORMULAS
NEW TABLES

for the exact measurement of multiple worms and screws of unknown profile.

The Fundamental Fact

The axis of a wire resting in a thread assumes a position tangent to the helix passed through the center of the wire and not the point of contact.

Van Keuren Measuring Wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. Reputable manufacturers of ground taps and thread gages used for the production and acceptance of threaded holes and nuts use Van Keuren Measuring Wires. You will seldom find them in error if you, too, have Van Keuren Measuring Wires.

The 208-page 1948 Van Keuren Catalog and Handbook No. 34 includes new epoch making formulas and 10 new tables which reduce the computations for the exact measurement of any screw to a process of simple division. Your copy will be mailed promptly upon request.

Set No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires..... $ 95.00
Price, Carboloy Wires..... 240.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

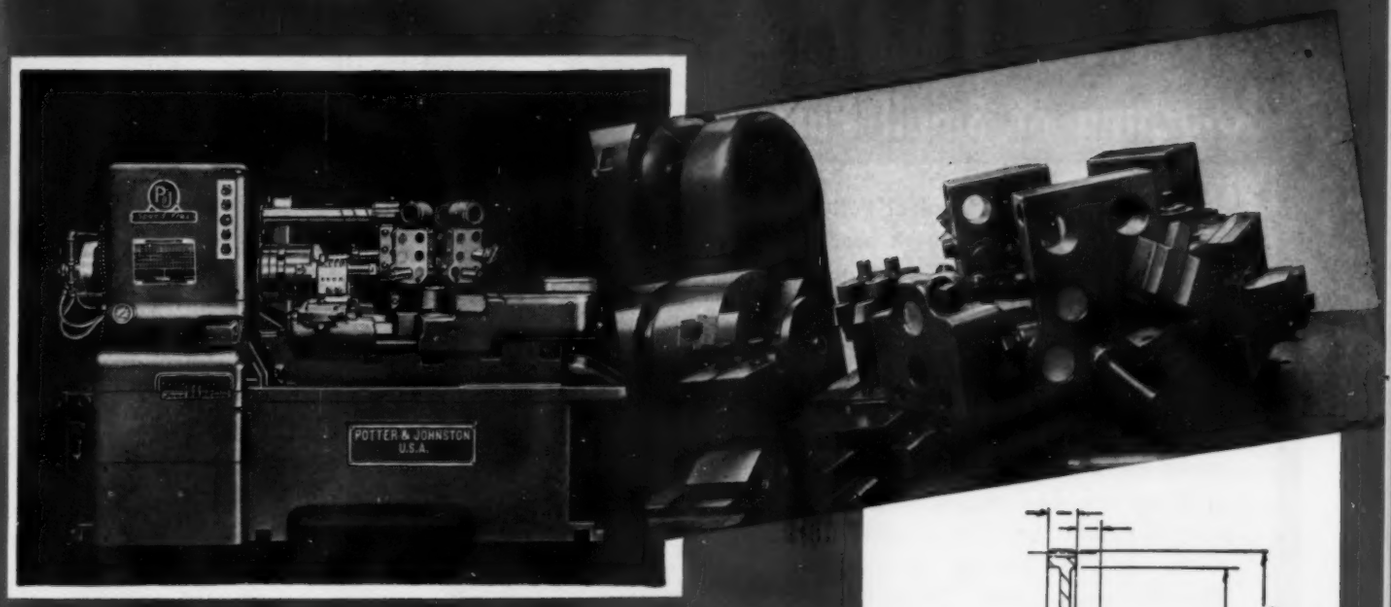
29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

2.34 *minutes floor-to-floor time!*

proving the high productivity of the

NEW P&J 3 U SPEED-FLEX



Designed especially for fast, economical production of small parts up to 6" diameter, this new Automatic Turret Lathe, modern in every detail, is sturdily designed and amply powered for the use of carbide cutting tools.

Details of the job being handled disclose how advantage has been taken of the tooling flexibility inherent in this new machine.

Among the features contributing to speed, accuracy and convenience are: four automatic changes of speed and three automatic feed changes all handled by electro-pneumatic control of multiple disc clutches; change from rapid traverse to reverse feed, or vice versa, effected in one-fifth second; independent or simultaneous action of cross-slides in conjunction with selected turret faces or with all six turret faces.

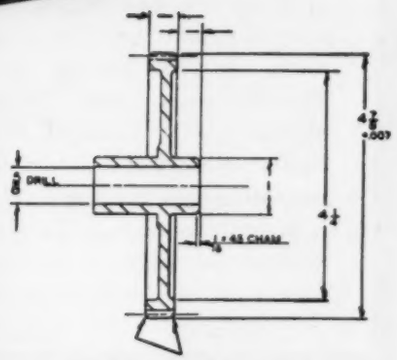
With the exception of loading and removal of finished work, operation is entirely automatic, enabling one attendant to handle several machines conveniently and easily.

●

POTTER & JOHNSTON MACHINE CO.

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, RHODE ISLAND



DETAILS OF JOB

Part: Take-up Gear

Material: Cast Iron

Method and Operation:
Presenting short hub to spindle, grip on same with 3 chuck jaws.

Machine as follows:

1st T.F.: Core drill hole; rough turn and face long hub; spot face washer seat.

2nd T.F.: Rough turn O.D.; face both sides at rim; bore under rim; groove for slide tool.

3rd T.F.: Face web (Slide tool)

4th T.F.: Finish turn face and chamfer hub; turn O.D.; face one side at rim; finish bore hole; chamfer hole.

5th T.F.: Blank

6th T.F.: Ream hole 11/16" dia.; size turn 1.000" dia. hub.

Floor-to-floor time: 2.34 min. (average) Pieces per hour (100% efficiency): 25.5

●

Send parts or drawings of your small parts and ask P&J engineers to make a time study and report their findings.

Announcing

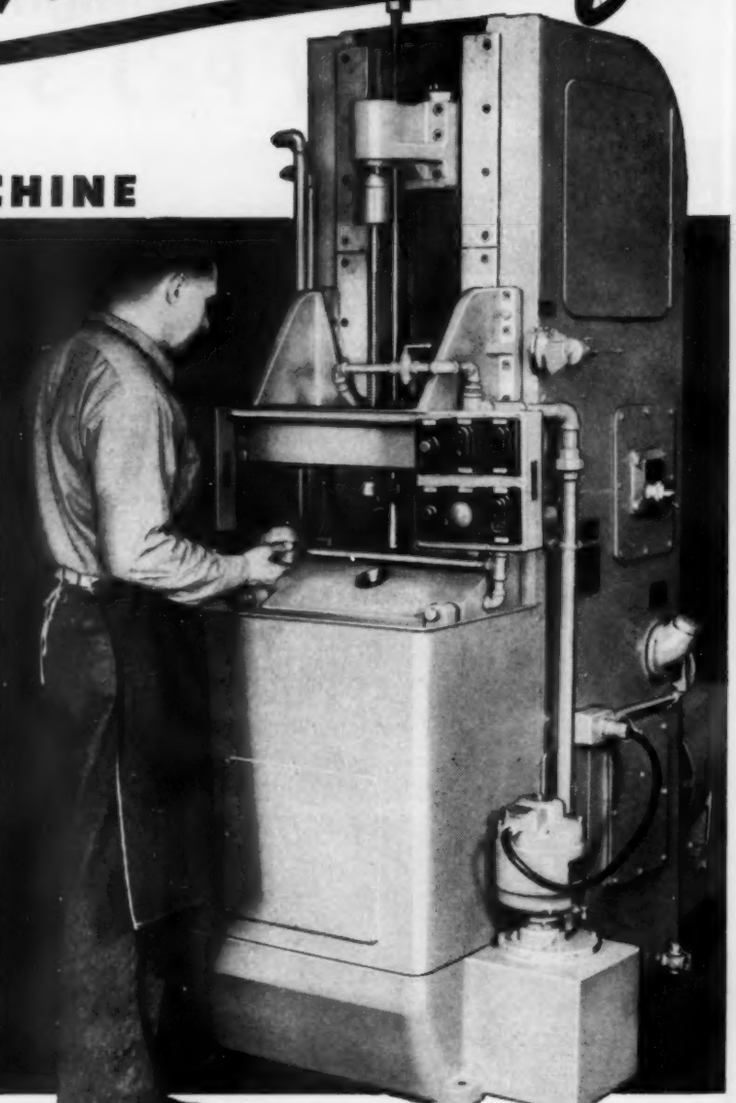
A NEW *American* MACHINE

For High Production Broaching of Small Parts

This new *American* Vertical Pull-Up machine is designed for high production internal broaching of small parts. It features electrical controls, push button operated; arranged to complete one full cycle on semi-automatic operation. Provision can be made, if necessary, to stop machine at end of broaching stroke for step-cycle operation.

When size and shape of the part permits automatic loading, fully automatic operation can be obtained on this VP type machine. This is accomplished by the adaptation of a hydraulically interlocked loading slide and a magazine type loading unit.

Multiple tooling can be provided for greater production by increasing the number of broaching stations.



Illustrated above is the *American* VP 2-8-24 Vertical Hydraulic Internal Pull-Up broaching machine with single station tooling for broaching the hole and 19 involute splines in automotive clutch hub. Prior to broaching, the part is loaded on a shelf, locating it on the center line of the broach. As broach is automatically elevated the part moves up to broaching position against under side of the work bushing. Pull head automatically engages broach, pulling it through work and at end of broaching stroke part drops onto shelf and is manually unloaded. This special tooling design was provided to prevent excessive drop of the part after broaching and marring of the previously finished surface. (Where dropping of the part is not harmful, loading is accomplished by dropping parts over the shank ends of the broaches; at end of stroke parts drop on deflector pan for automatic ejection.)

Write for Circular on VP Machines

Full details and specifications are available in the *American* VP type hydraulic broaching machine circular. A copy is yours for the asking. Write today for circular VPA.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

The CONE AUTOMATIC MACHINE COMPANY *sees many* GOOD THINGS AHEAD

It is reported that . . . . . .

Fitchburg Grinding Machine Corp. has a machine that grinds automobile valves to size at the rate of 2,160 per hour.

get ready with CONE for tomorrow

Small glass globules of exploded glass, similar to popcorn are made by Dant & Russell of Portland, Oregon, and are used to replace sand in plaster.

be ready with CONE for today

Reaction of corn sugar with hydrogen to form sorbitol is accomplished in minutes by the new high-pressure catalytic process of Atlas Powder Co.

get ready with CONE for tomorrow

The new plant of Houston Oxygen Co. will be the first to produce acetylene commercially by the electric "glow" process.

be ready with CONE for today

A library of rubber technology, sponsored by the American Chemical Society, will be set up at the University of Akron.

get ready with CONE for tomorrow

E. I. duPont de Nemours & Co. claims that its new color film "S–T Tripac," can be processed as simply and quickly as black and white.

be ready with CONE for today

The wheels on the new Corlett-Turner bench grinder can be changed in nine seconds.

get ready with CONE for tomorrow

U. S. Rubber Co.'s new automobile cushions can be inflated to any pressure that the passenger likes.

be ready with CONE for today

The new Tournamover straddles an entire building, up to 25 feet, picks it up and moves it to a new location.

Temperatures down to −456° F. are possible with the new helium cryostat developed by Arthur D. Little, Inc.

get ready with CONE for tomorrow

Roughness measurements around internal and external surfaces of rotation can now be made by means of a Rotary Piloting Fixture offered by Physicists Research Co. for use with the Profilometer.

be ready with CONE for today

Anthracite Industries, Inc., announces that its new coal-burning heater is 38% more efficient than ordinary furnaces and will be made in steam, hot water and hot air models for either domestic or commercial use.

Studies at the National Bureau of Standards show that diamonds are highly sensitive to gamma rays and may be used like a Geiger counter.

get ready with CONE for tomorrow

Chance Vought has a contract to build a new fighter plane that will be made almost entirely of their Metalite sandwich material — a balsa and aluminum lamination. Tests show the new material to be lighter and stronger than conventional materials.

be ready with CONE for today

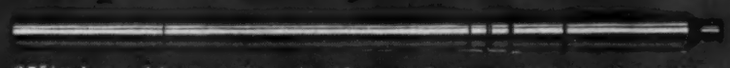
At the Fort Gibson, Oklahoma, dam, ice cubes are being mixed with concrete to cool it before pouring.

get ready with CONE for tomorrow

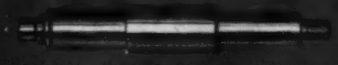
The incredible speed of 11 million pictures per second has been achieved by a motion picture camera developed at the University of Rochester.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

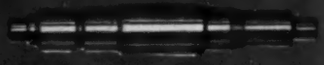
Emphatically Conomatic!



25⅝" long, 16 operations in 63 seconds from 1⅜" dia. hot rolled.

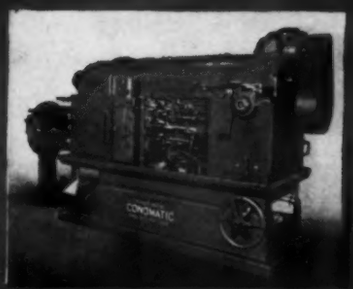


10⅞" long, 16 operations in 65 seconds from 1 41/64" dia. SAE 4620.



10⅝" long, 12 operations in 54 seconds from 1⅝" dia. SAE 3115.

Any good multiple spindle automatic should handle the ordinary run of shaft work. But Conomatics are also adaptable to the unusually *tough* jobs. The illustrations show this plainly.



Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

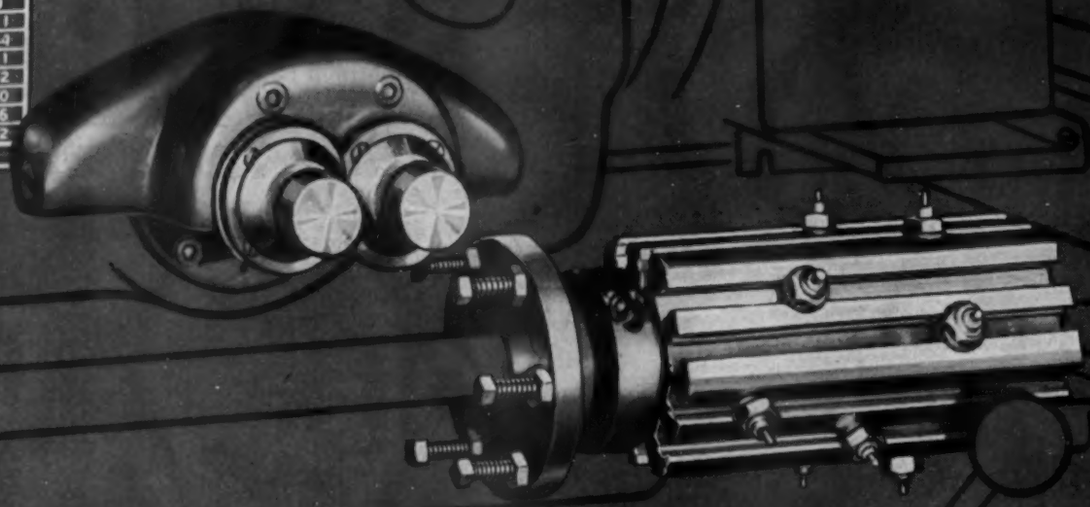
49

GISHOLT FASTERMATICS

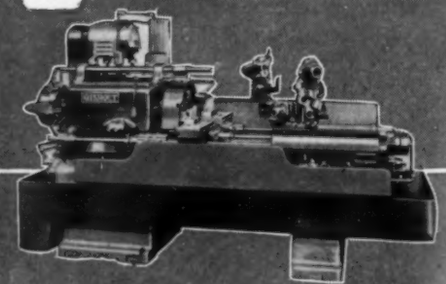
(AUTOMATIC TURRET LATHES)

RANGE GEARS NO. TEETH UPPER LOWER	SPINDLE SPEEDS VALVE DIAL POSITIONS NO. 183	NO. 184	NO. 283
45 65	22	40	74
49 61	27	50	91
53 57	33	61	111
57 53	40	73	134
61 49	46	87	161
65 45	57	105	192
69 41	68	125	230
73 37	81	150	276
77 33	98	181	332

DRIVE SHAFT SPEED 1040 R.P.M.



These simple controls provide automatic (or manual) selection of speeds--to save time --cut machining costs



GISHOLT MACHINE COMPANY, *Madison 3, Wisconsin*

THE GISHOLT ROUND TABLE

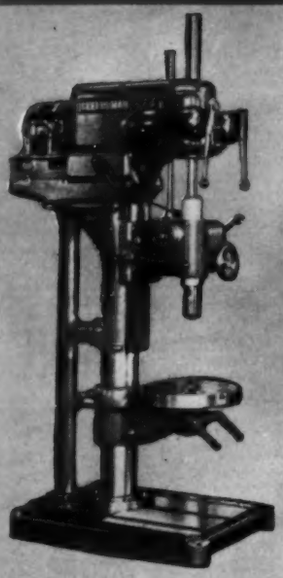
represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.

THE FASTERMATICS—Speed changes are effected as buttons in spool contact hydraulic control knobs. Changes may be made automatically at any point during hexagon turret's travel, or manually for convenience of set-up. Various ranges of spindle speeds are available.

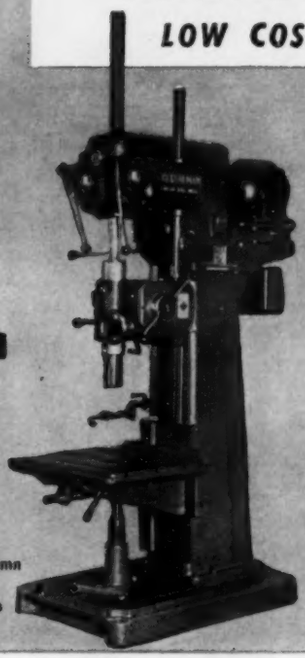
turret lathes · automatic lathes · superfinishers · balancers · special machines

CLEEREMAN DRILLING MACHINES

FOR SPEED — ACCURACY
—ADAPTABILITY—
LOW COST PRODUCTION

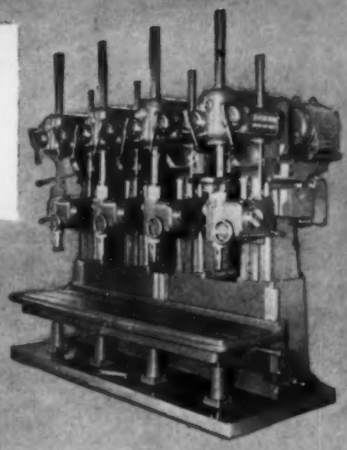


Cleereman Round Column Sliding Head Drilling Machines



Cleereman Box Column Sliding Head Drilling Machines

Cleereman No. 325 Single Unit Sliding Head Drilling Machine



Cleereman Multiple Drilling Machines

1908 - 1948 40th Anniversary CLEEREMAN MACHINE TOOL CO.

Cleereman builds a complete line of drilling machines for production work. All have won wide acceptance both here and abroad. All are noted for their high standards of performance, wide adaptability and extreme ease of operation.

The new No. 325 Single Unit Sliding Head Drilling Machine provides extreme sensitivity with rugged construction and is characterized by facility of control, exceptional flexibility and easy set-up.

Cleereman Round Column Sliding Head Drilling Machines are built in 25" and 30" sizes with a wide range of speeds and feeds. They are sturdy, precision built machines readily adapted to a wide variety of manufacturing operations.

Cleereman Box Column Sliding Head Drilling Machines in both 25" and 30" sizes have the stamina and accuracy necessary to meet the severest requirements of production work.

Cleereman Multiple Drilling Machines are available to meet individual production requirements for high speed production with accuracy and convenience.

Wire or write for Catalogs and complete specifications.

Address —

BRYANT Machinery & Engineering Company
General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

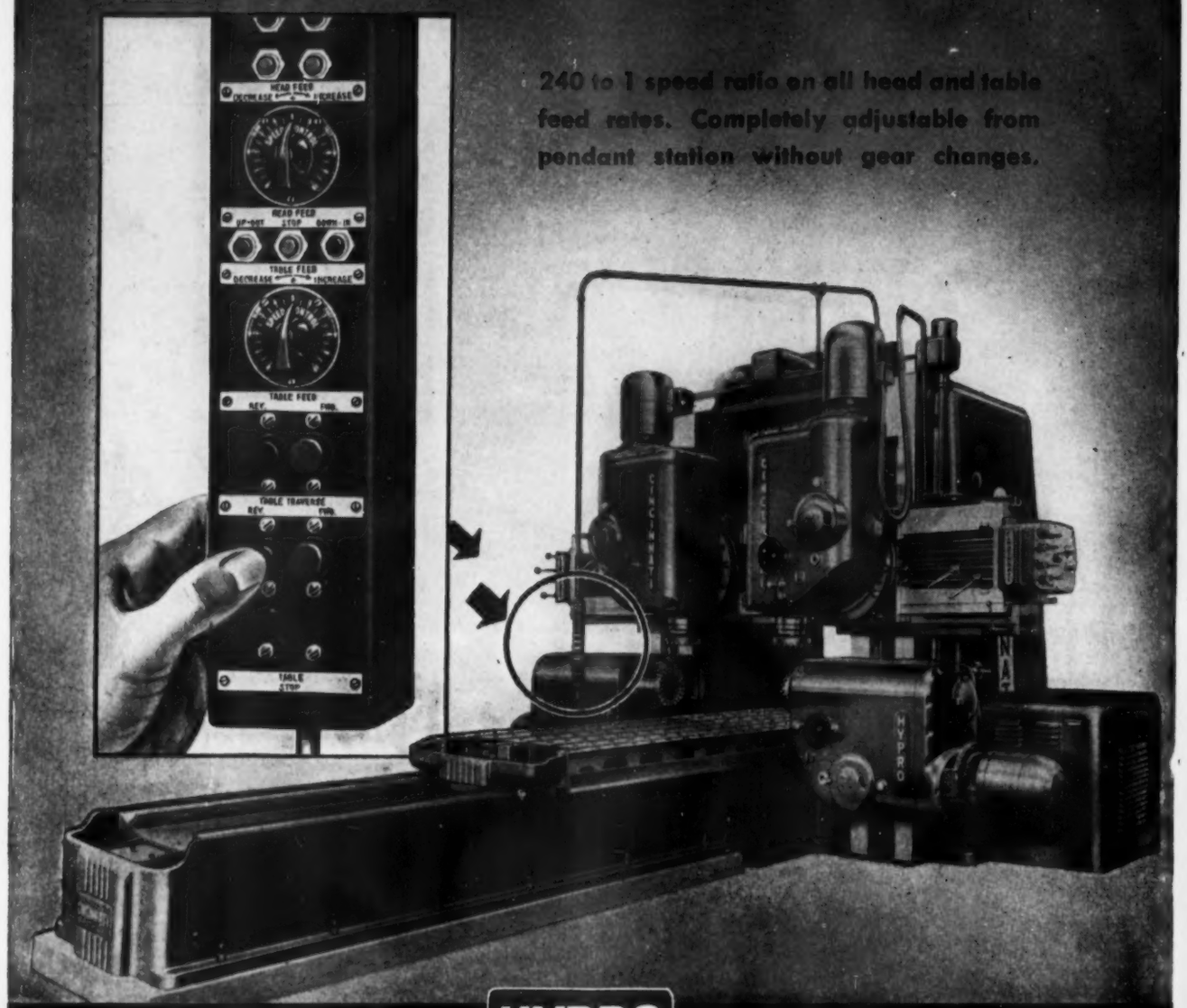
CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

240 to 1 SPEED RATIO...

Hypro-electronic

PLANER MILLER DRIVE

240 to 1 speed ratio on all head and table feed rates. Completely adjustable from pendant station without gear changes.



THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

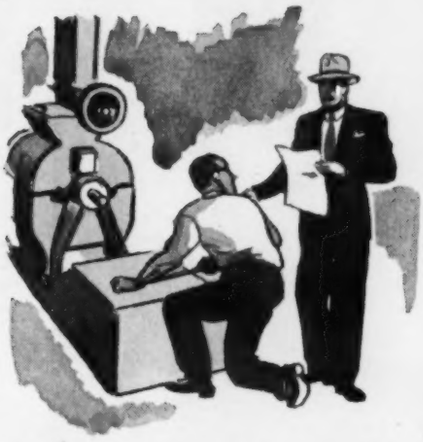
CINCINNATI, OHIO

Looking for Motors? Maybe We Can Help You!

ALLIS-CHALMERS AUTHORIZED DEALER

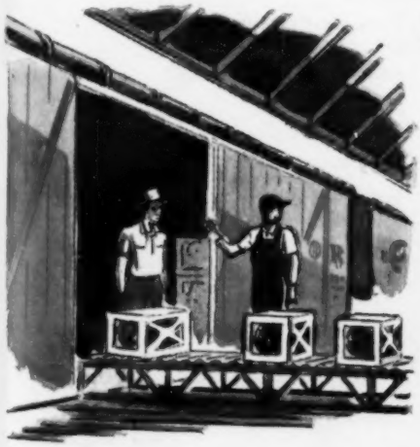
ALLIS-CHALMERS REPRESENTATIVE

Do You Need General-Purpose, squirrel-cage motors from 1 to 200 hp? Get in touch with your nearby Allis-Chalmers *Authorized Dealer* or District Office. Either may be able to help you from stock right now!



But For Really Big Motors — 250 to 25,000 hp and over — call your Allis-Chalmers *field engineer.* He's an *expert* on motors—can help you solve difficult drive problems, involving large or small motors, in the most economical manner.

Want Reliable Information on motor delivery? Call *either* your Allis-Chalmers dealer or district office. They have *up-to-the-minute* delivery information available to them!



Motor "Headquarters"—½ to 25,000 hp and Up!

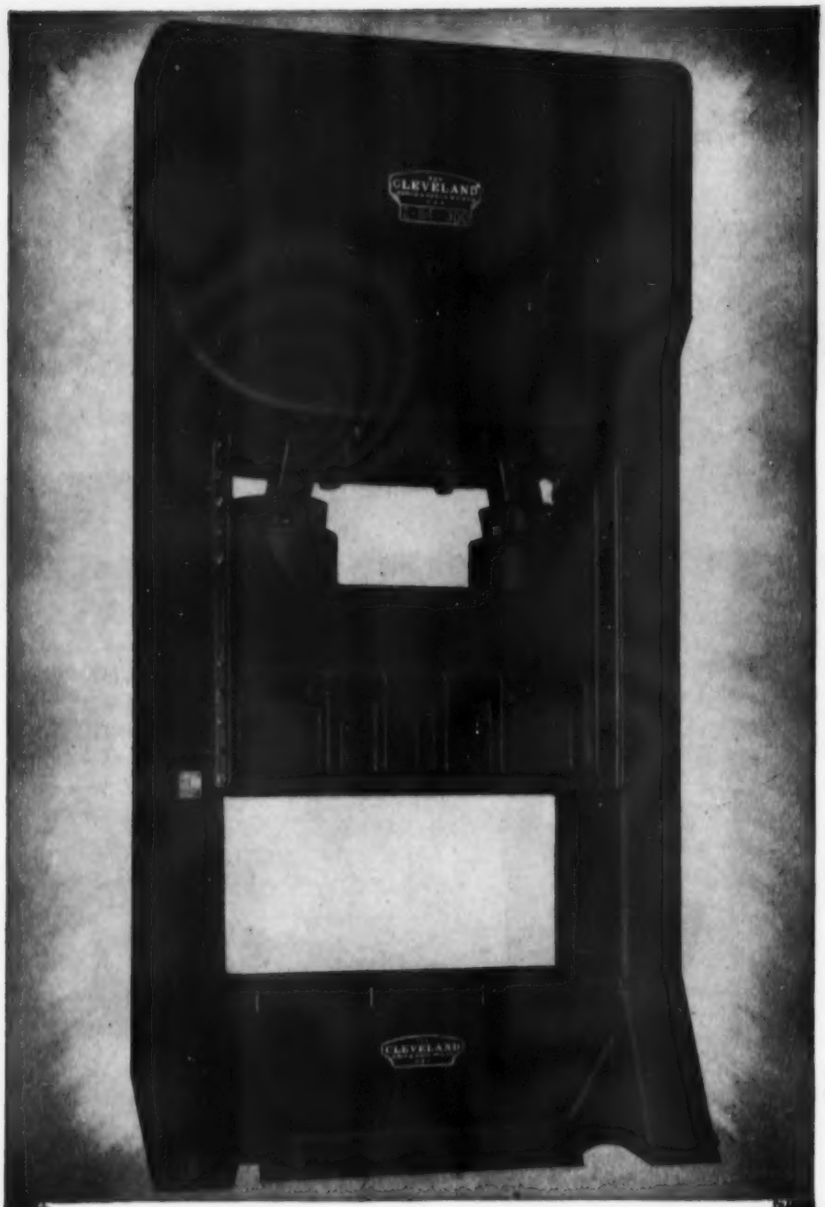
YOU SELECT from a *wide range* of motors when you call on Allis-Chalmers. And you can count on *expert* motor advice, too! The best possible motor selection is the result of careful appraisal of drive characteristics, the driven equipment, power source and surroundings. The best motor may not always be the first that meets the requirements.

Allis-Chalmers authorized motor dealers or factory representatives can help you choose wisely. They can save you time and money. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2401

The Delivery Picture's getting brighter! Our motor-building capacity has been greatly increased. We've put new methods, new equipment to work to turn out *more* motors for industry, faster!

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products



Cleveland Two Point Presses can be furnished in sizes and capacities to suit requirements

Modern Cleveland Presses, similar in design and construction to the Press illustrated above, can be furnished with a single connection, two connections or four connections, in sizes and capacities to suit particular requirements.

The Press shown above has two connections to the slide, one at each side, and is equipped with an electrically controlled air operated friction clutch and brake.

This Press has an 18" stroke, 18" adjustment, 48" shut height, 48" x 84" bed area, operates at 18 strokes per minute and has a capacity of 300 tons.

If you are interested in any type or size of Mechanical Power Press, it will pay you to follow the example of other leading Press users and select Cleveland Presses.

CHECK THE FACTS—

on this NEW and DIFFERENT

CLEVELAND
Drum Type Clutch

To appreciate the advantages to be gained by the use of this new Cleveland Drum Type Clutch, we invite you to check the following facts against any other type of Friction Clutch, because we believe they offer convincing proof of its efficiency, economy and low upkeep.

- One fourth the weight of a conventional disc clutch.
- Approximately half the number of parts.
- Light weight assures saving in horsepower.
- Quicker starting and stopping.
- Complete disengagement of all idle friction surfaces.
- Self adjusting, easy maintenance, low upkeep.
- Can be serviced without removal from the Press.
- Maximum performance with minimum amount of air.
- Positive Brake.
- Can be set to slip under overload.
- No excessive heating.
- Is mounted directly on driveshaft.
- Combined unit of one-piece construction.
- Clutch and brake cannot become separated or engaged simultaneously.

•

(For the time being this Cleveland Drum Type Friction Clutch is available for NEW Cleveland Presses only.)

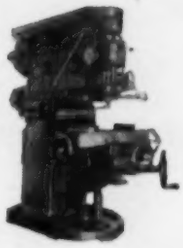
CLEVELAND

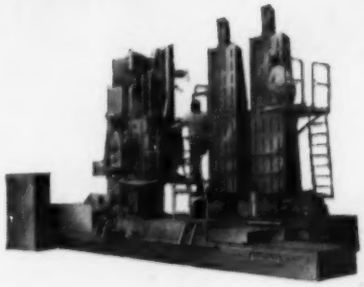
THE CLEVELAND PUNCH & SHEAR WORKS CO. • CLEVELAND 14, OHIO

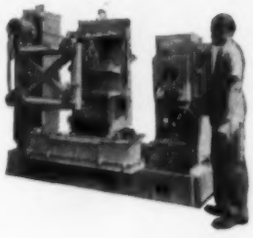
NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

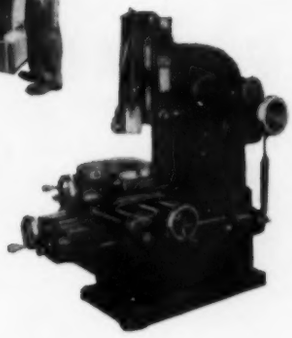
Now one source supplies everything you need

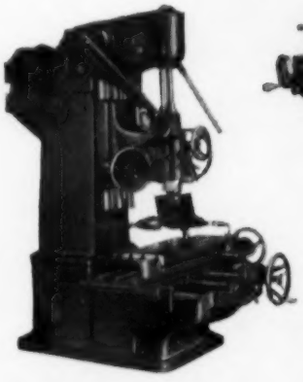
to make any kind of die or mold

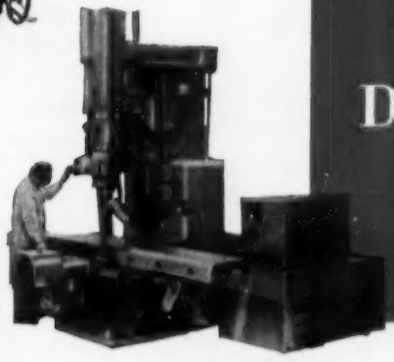












From a single source — Pratt & Whitney — flows everything you need to make any kind of die or mold of any type or size. The fact that it's *Pratt & Whitney* means you get *precision equipment* of right design produced by skilled craftsmen working to a single high standard of precision and quality. And the fact that Pratt & Whitney is the *single source* means you get *unified responsibility* for the performance of machines and equipment, better results at lower cost, and no buck-passing when you need help. Write for detailed literature. No obligation, of course.

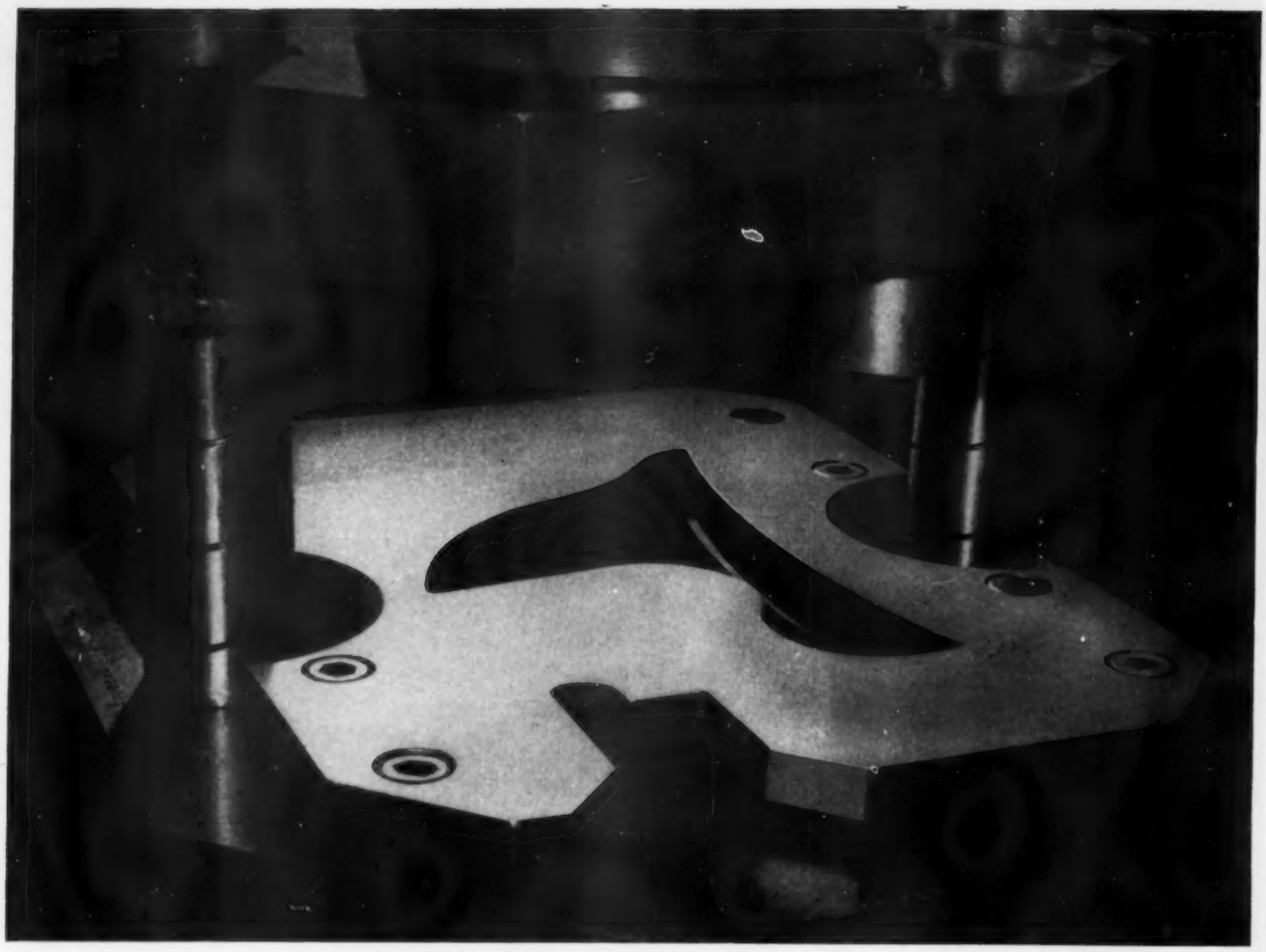
1. DIE SINKERS — Plain and Universal — for making original dies and molds by conventional methods, from drawings or prints.
2. KELLER MACHINES, for making original dies and molds from master forms, using automatic tracer control. In seven sizes up to 12′ x 6′ capacity.
3. AUTOMATIC DUPLICATING MACHINES, for duplicating small and medium-large dies and molds automatically and economically.
4. VERTICAL SHAPERS, for shaping contours and reliefs in blanking, trimming, drawing, and piercing dies, punches, and strippers.
5. JIG BORERS, for precision-boring of punch and die sets and intricate molds and dies, of all kinds.
6. JIG GRINDER, for relocating and finish-grinding straight or tapered holes to "tenths," in hardened steel. (First shown at the '47 Machine Tool Show.)
7. KELLERFLEX MACHINES — flexible shaft equipment for efficient finishing of dies and molds. Both multi-speed and direct drive types, in 14 models.

NOT ILLUSTRATED: KELLER CUTTER AND RADIUS GRINDER: sharpens die-sinking and Keller cutters, shapes Keller tracer points. VERTICAL DIE GRINDER: prepares new die block surfaces prior to machining, sharpens dull dies, reconditions die block faces before resinking operations. BURS (rotary files); used in Kellerflex and similar machines, for finishing jobs. P&W furnishes hundreds of styles, shapes, sizes in both high-speed steel and carbide, plus grinding and polishing wheels, etc. SMALL TOOLS: including die-sinking cutters, Keller cutters and tracer points, drills, reamers, counterbores, end mills for jig borers. P&W GAGES: entire range of cylindrical gages, thread gages, snap gages, precision gage blocks, and basic measuring equipment.

PRATT & WHITNEY
Division Niles-Bement-Pond Co.
WEST HARTFORD 1, CONNECTICUT

PRATT & WHITNEY
Die-and Mold-Making Equipment

"There is no better-paying investment than the right tools for the job"



THE PROOF OF THE DIE . . . IS IN THE STEEL

Heavy-duty dies cost many times the value of the steel from which they are made. Skilled die-makers must put in many long hours to insure split-hair accuracy. Equal care must be devoted to the heat-treating, finishing, and other critical operations.

But, unless they can produce and stand up under severe service, finished dies are worth nothing more than their weight as scrap. That's why it's so important to select the proper steel for dies. The best in workmanship and heat-treatment can't make a high-production die if the steel isn't right.

Bethlehem die steels have been proved by years of making good in tool and die shops. The popular grades are:

X, XCL, XX (Carbon Tool Steels) general-purpose, water-hardening

BTR (Bethlehem Tool Room) safe, oil-hardening

B A-H (Bethlehem Air-Hardening) non-distorting, air-hardening

Lehigh H (Lehigh Die, H Temper) high production, air- or oil-hardening

Each of these specialized steels has properties which make it the best choice for some specific requirement.

Whatever your die-making problems may be, you can look to Bethlehem for the "know-how" on die steels. The nearest distributor or district office will gladly give you detailed information.

Bethlehem Steel Company, Bethlehem, Pa.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ BETHLEHEM STEEL ★

Bethlehem **TOOL AND DIE STEELS**

FOR MORE PRODUCTION

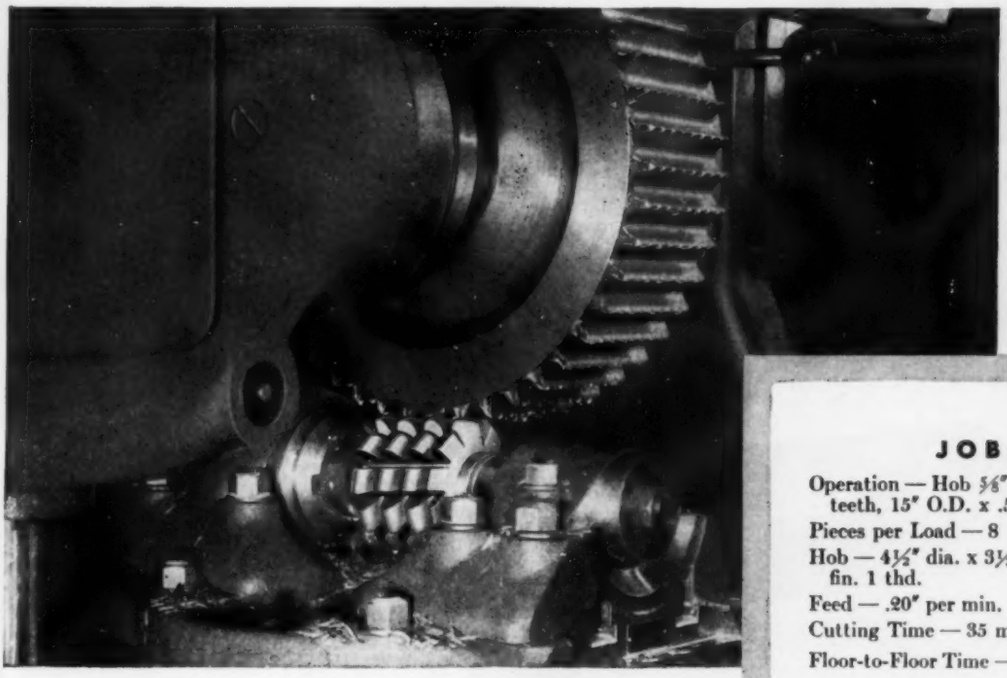
The flexibility of the No. 14-15 Hobbing Machine for hobbing a wide variety of work — ranging from large coarse pitch gears to long spline shafts — provides low-cost production efficiency, with a minimum investment in special equipment. Consistent accuracy is possible because of rigid massive construction, hardened and ground "V" ways, and positive mechanical control over all machine functions.

These large diameter, coarse pitch roller chain sprockets require a machine with rigidity and strength for efficient production. The Barber-Colman No. 14-15 Hobbing Machine provides capacity to finish hob, in *one cut*, a load of 8 sprockets in 42 minutes floor-to-floor time, or a total of 104 sprockets per 9 hour shift. Automatic cycling furnishes easy control over all machine movements, and a special hydraulically operated work arbor speeds loading time.

Send for a copy of Bulletin 3220 describing ample capacity and rigidity of this machine for heavy cuts.

Barber-Colman Company

GENERAL OFFICES AND PLANT 184 LOOMIS ST., ROCKFORD, ILL.



JOB FACTS

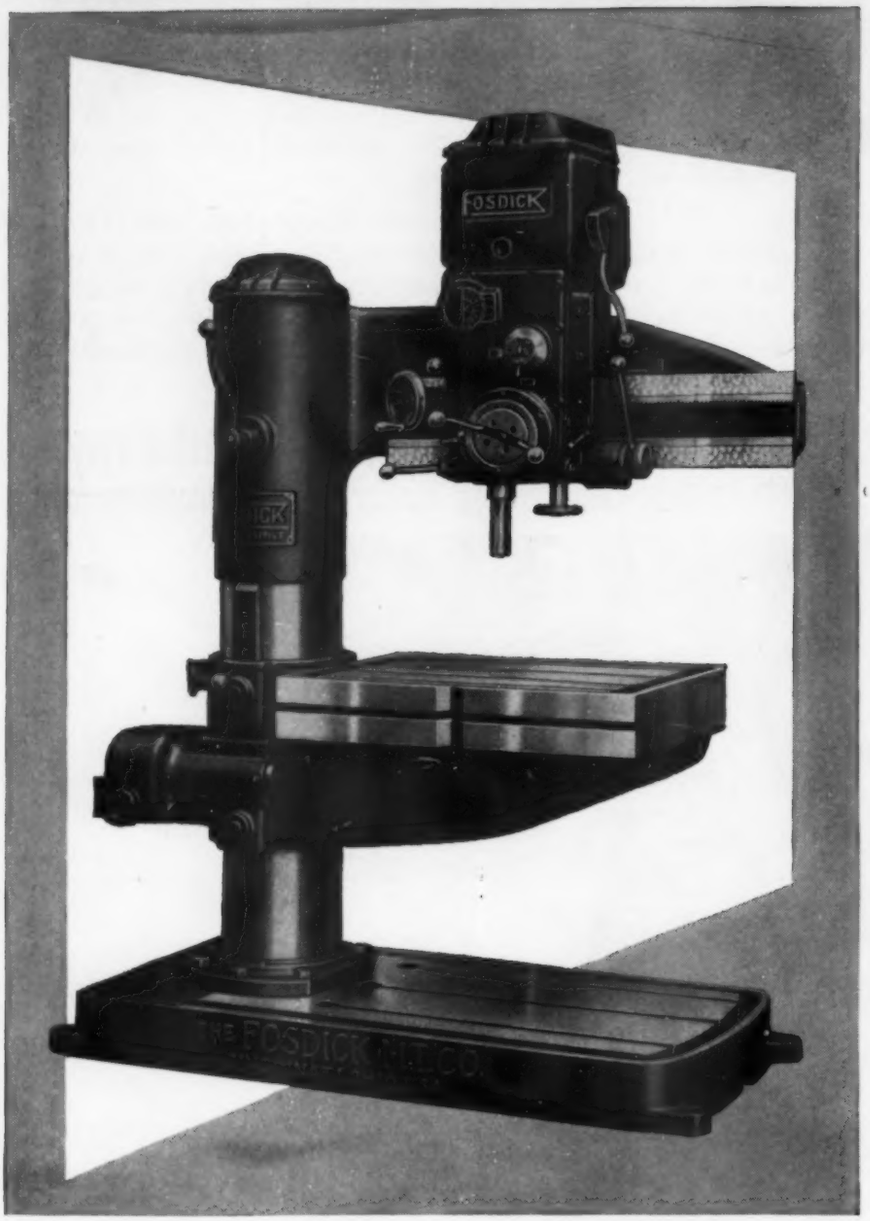
Operation — Hob 5/8" roller chain sprockets, 46 teeth, 15" O.D. x .575" face.
Pieces per Load — 8
Hob — 4½" dia. x 3½" length, str. bore, ungrd. fin. 1 thd.
Feed — .20" per min. Hob Speed — 77 RPM
Cutting Time — 35 minutes
Floor-to-Floor Time — 8 sprockets every 42 min.

BARBER COLMAN

A COMPLETE HOBBING SERVICE

NEW · · · DIFFERENT *and* FLEXIBLE

FOSDICK *Sensitive* RADIAL



● Here's a combination Radial and Sensitive Drill that fills a long felt need for a high speed sensitive drill with the advantages of flexibility offered in radial design.

This machine differs from the conventional design in that it has the arm at a fixed height and a movable table in addition to the customary base. Both the arm and the table can be swung in an arc of 360°.

The movable table may be raised or lowered either by power or hand and permits locating table easily and quickly to the proper position for the job at hand. When power is used the control for the motor is interlocked with the clamping and unclamping of the table.

Another advantage is the key fitted into the column to insure table raising parallel to the base at all times. The table being mounted on the column permits it to be swung behind the column and taller jobs can be mounted on the base.

It has all the normal advantages of a sensitive drill as to range of feeds and speeds plus the convenient operating features of a radial.

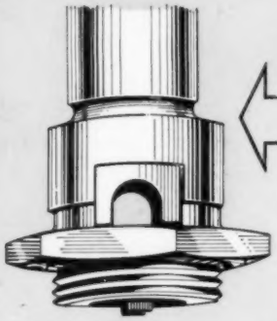
Get all the details. Write today for the new Fosdick Sensitive Radial Bulletin—S.R.A.

●

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

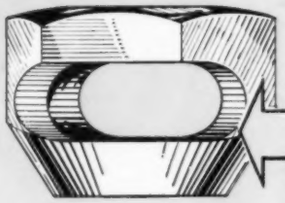
Facts about "ACORN" DIES

The "Acorn" Die has produced billions of threaded parts since its introduction in 1909. It has given superlative performance in thousands of plants where high production, high speed, accuracy and thread quality are all "musts". The reason for its popularity is its simplicity, ruggedness, and accuracy. Its design explains why the "Acorn" fills the bill.



HOLDERS fit any machine. Lock nut sets die at any desired adjustment.

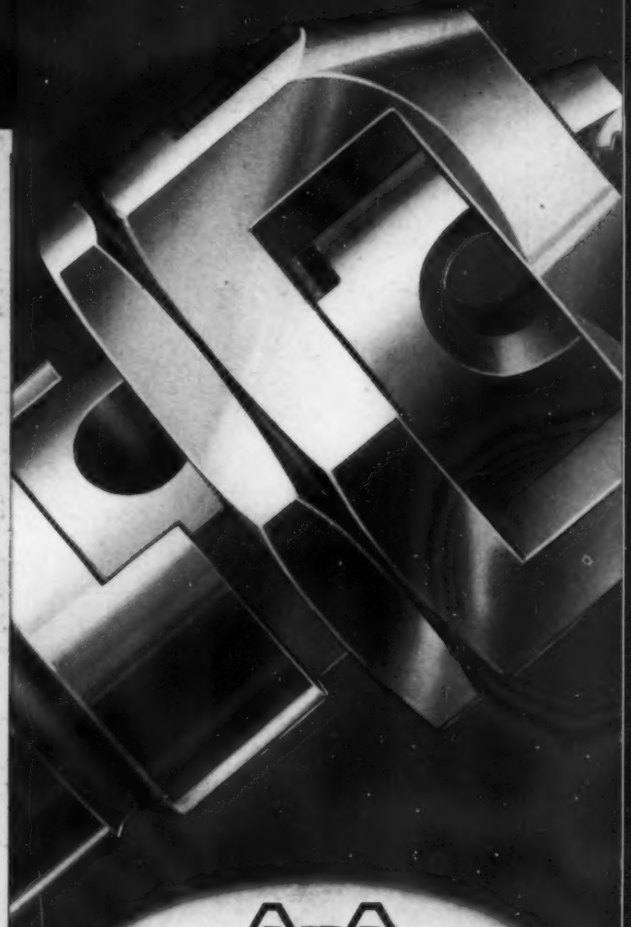
"ACORN" DIE with threaded prongs.



ADJUSTING CAP presses equally on all prongs for easy, accurate adjustment.

TO USE: Just screw up the cap to desired adjustment and turn up the lock nut. A threaded plug comes with each die. This test plug has been threaded by the die with which it is packed and insures the accuracy of your set-up. *"Acorn" Dies are stocked by your "Greenfield" Distributor.*

For the complete story of the "ACORN" DIE write for booklet!



GTD GREENFIELD

World's Leading

THREADING TOOLS

When you buy GTD "Greenfield", you get a quality of product that comes from the world's largest, most modern threading tool plant and its research staff of threading engineers—PLUS SERVICE from the leading distributors and GTD "Greenfield's" field men in every industrial center.

GREENFIELD TAP and DIE CORPORATION GREENFIELD, MASSACHUSETTS

Precision THREADING TOOLS

GEOMETRIC

CLASS S Collapsing TAPS

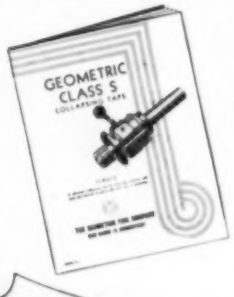
A "Universal" Tap for Jobs Over 1¼"

These famous Geometric taps not only fit almost any machine but will also do almost any internal threading job over 1¼" in diameter.

Finely proportioned, rugged in construction, and simple in operation, each GEOMETRIC CLASS S COLLAPSING TAP cuts such a wide range of diameters and pitches that it will often do the work of two competitive tools.

With a few simple adjustments and without buying additional parts, the S Tap can be converted to Stationary Type, Plate Trip — Rotary Type, Plate Trip — Rotary Type, Sleeve Trip — and Hand or Lever Trip. GEOMETRIC CLASS S COLLAPSING TAPS available for tapping diameters from 15/16 to 8½ inches. In addition to the standard line of S Taps, Geometric also builds many types of Special Taps. If you have a job requiring a Special Tap, put your problems up to Geometric. There's no obligation! *If you have an internal threading job over 1¼" send today for a free bulletin on these famous GEOMETRIC CLASS S COLLAPSING TAPS.*

USE COUPON FOR FREE INFORMATIVE BULLETIN NO. S-3



THE GEOMETRIC TOOL COMPANY
7 Valley Street
New Haven 15, Connecticut

Please rush me a copy of Bulletin No. S-3 which describes in detail the many advantages of the Geometric Class S Collapsing Tap.

Name _____

Firm _____

Street _____

☐ *Bus.* ☐ *Res.*

City _____ *Zone* ____ *State* _____

GEOMETRIC

4 CORNERS
formed every
7 SECONDS

Hydraulic Corner Forming Unit

speeds refrigerator food compartment liner production

For example, common practice was to blank and form one corner at a time, weld, and then metal finish. Dies were expensive, so was finishing department labor. With Vulcan's Hydraulic and electrically controlled Forming Unit all four (4) corners are formed at the same time every seven (7) seconds. One operator. No punch presses needed.

Forms 4 corners simultaneously

Saves man hours

Saves floor space

Let's talk about special tools and machinery for speeding *your* production. For better acquaintance ask for Vulcan Equipment List.

Vulcan Tool Co.
DAYTON 10, OHIO, U. S. A.
COMPLETE TOOLING PROGRAMS

Metal Cutting

MARVEL SAWS

Better Machines-Better Blades

Regardless what type hack saw machines and metal-cutting band saw machines you use, MARVEL BLADES will improve performance. There are sound reasons why this is true; practical reasons that are easily understood and demonstrated.

MARVEL High-Speed-Edge Hack Saw Blades, with a genuine high-speed-steel cutting edge integrally welded to a tough alloy steel body, are both fast-cutting and *positively unbreakable*. This construction permits greatly increased speeds and feeds and tauter blade tensioning. Still, they last much longer than ordinary blades.

MARVEL High-Speed-Edge Hole Saws, with this same unbreakable construction and heavy-duty arbors, have the extra strength required for drill press and lathe use . . . rapidly saw holes from 5/8" to 4½" diameter thru steel of up to 1⅛" thickness.

MARVEL Band Saws are of selected quality. They come ready for use, pre-welded to size for each make and model saw. Individually boxed, they are protected against kinking, rusting or damage to teeth!

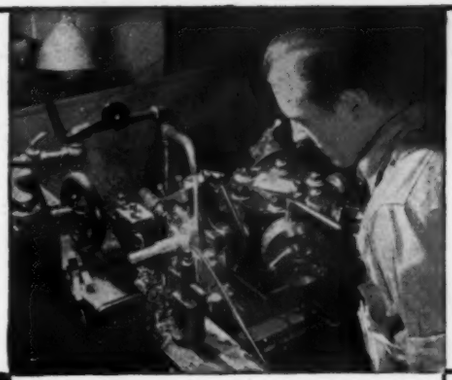
Write for Blade Catalog Sheet.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVE. • CHICAGO 39, U. S. A.

You can machine it.....

Better, with Warner & Swasey accuracy. At the Govro-Nelson Company, Detroit, Warner & Swasey Turret Lathes turned fine quality crankshafts from 2512 steel to tolerances of .0005" and cut threads at hardness of 35 Rockwell C!



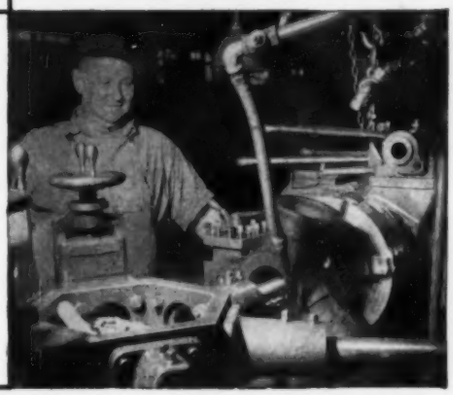
better

faster

Faster, with Warner & Swasey power. At the International Business Machine Corporation, Endicott, N. Y., *two* new high-speed Warner & Swasey Turret Lathes replaced *three* old machines and *still* cut machine time 27%.

for less

For Less, with Warner & Swasey durability. At the Steel Products Engineering Co., Springfield, Ohio, a Warner & Swasey 4-A Turret Lathe operated for 14 years on two continuous 10-hour shifts with never once removing the headstock cover!



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A primary function of our business is to help you "machine it better, faster, for less".

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At your request, a Warner & Swasey field engineer will call, without obligation, to study your needs and make recommendations. Write

WARNER & SWASEY
Machine Tools
Cleveland

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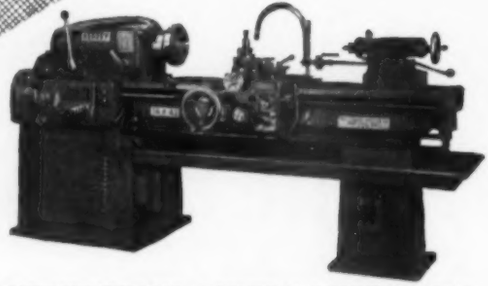
Essentially a belt-driven machine, the many refinements have made the new No. 2 a worthy successor to the famous Hendey Cone Head Lathe. There are a minimum of controls: a single lever for 100% safe belt shifting, a back gear control, a quick-change gear control, a push-pull knob for engaging feed gears with spindle. Yet the new No. 2 is unusually versatile for a machine of this class. It has eight spindle speeds from 32 to 1140 rpm, 48 thread and feed changes, a thread range from 1½ to 92 per inch and a spindle index for multiple threading. When you add to all this automatic lubrication, Hendey precision construction, a uniquely designed motor drive that eliminates the possibility of belt tension affecting spindle performance, you have a lathe that you can't afford to overlook. Write today for full details.



THE NEW HENDEY NO. 2 GENERAL PURPOSE LATHE

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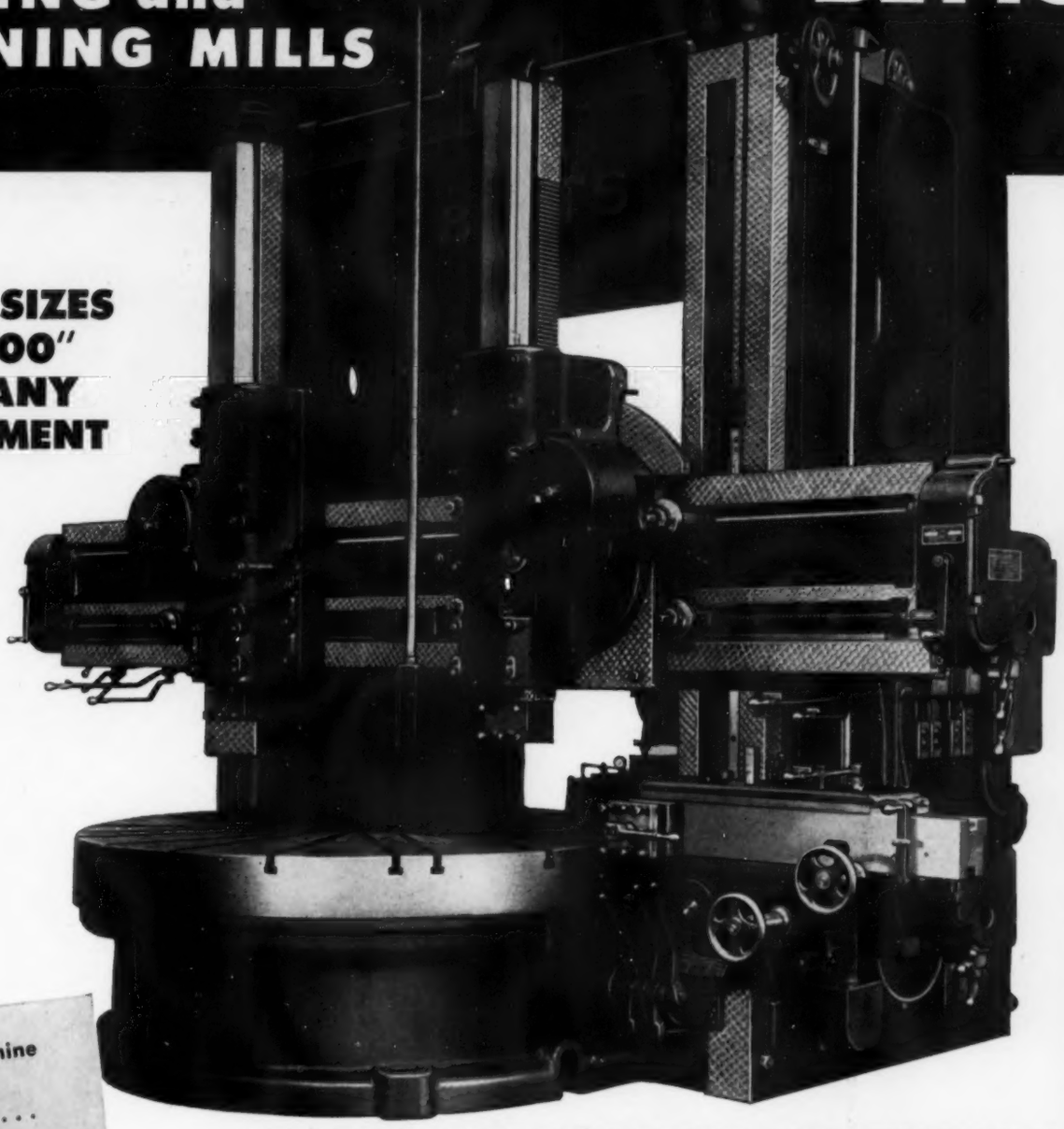
BUILT IN SIZES FROM 100" UP TO ANY REQUIREMENT

For full details on 100" Mill send for Bulletin No. 2128



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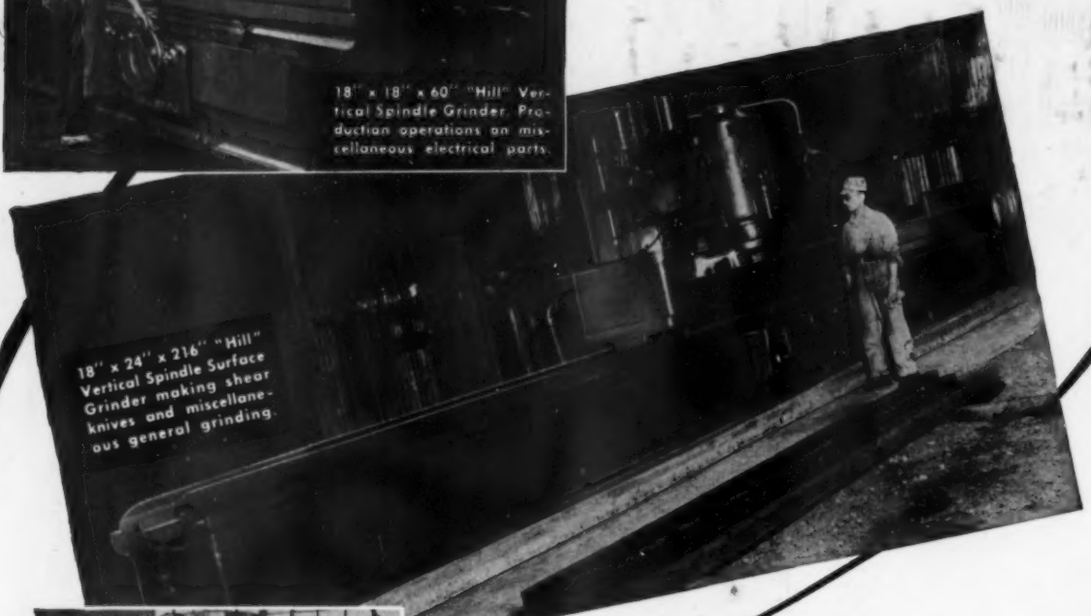
A WIDE VARIETY

18" x 18" x 60" "Hill" Vertical Spindle Grinder. Production operations on miscellaneous electrical parts.



18" x 24" x 216" "Hill" Vertical Spindle Surface Grinder making shear knives and miscellaneous general grinding.

24" x 24" x 60" "Hill" Horizontal Spindle Surface Grinder Precision grinding on tool and dies.

24" x 24" x 72" "Hill" Horizontal Spindle Surface Grinder, processing steel dies, shear blades and miscellaneous.

Extensive variation of grinding operations is everyday work for HILL Open Side Hydraulic Surface Grinders.

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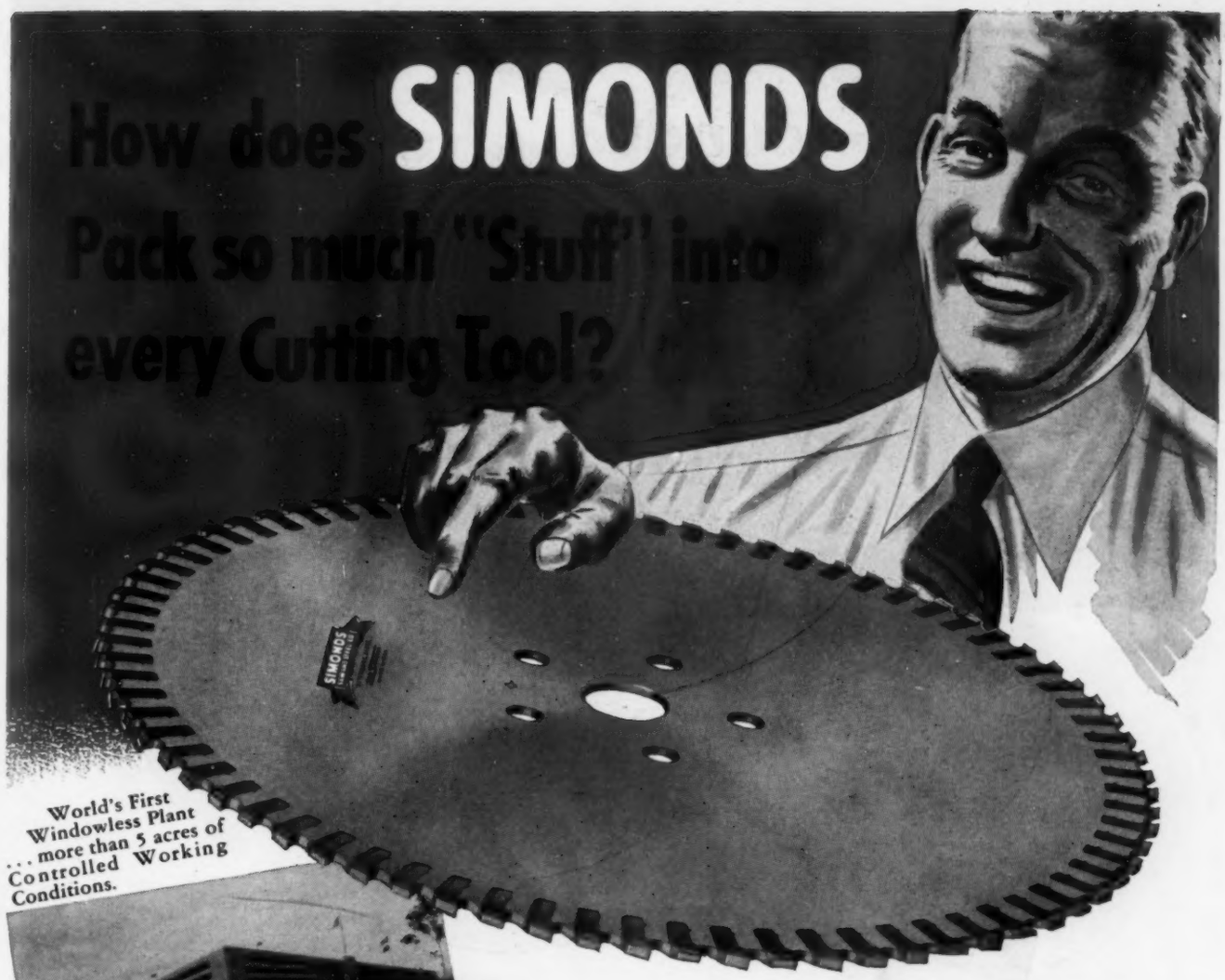

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Here are 6 Quick Answers

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2. **World's First Windowless Plant** . . . air, light, sound completely controlled for better work, higher product-quality, faster delivery.
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4. **Simonds Own "Sharpeners"** . . . Simonds organization includes a top producer of grinding wheels . . . part of the secret of Simonds famous "Mirror Finish."
5. **Simonds Research:** New metals, methods, and cutting tools . . . these come *first* from Simonds.
6. **Simonds 4-Company Organization:** All quality controlled from raw material to *you.*

That's why Simonds Tools cut *your* cutting costs. Order from your Distributor.

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When you use SIMONDS You stay in the Highlands OF CONSISTENT CUTTING EFFICIENCY

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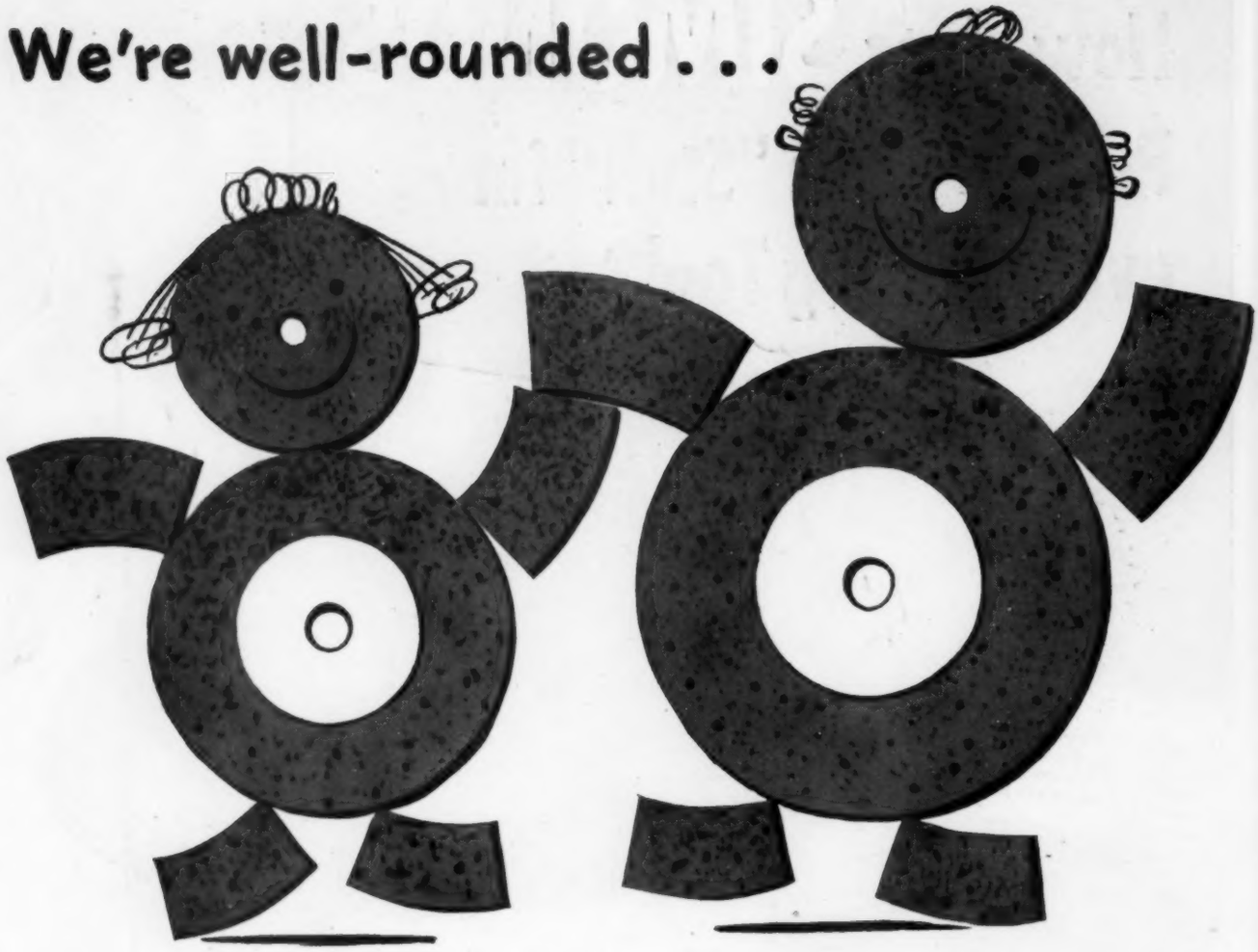

Resin-bonded wheels have been added to the Robertson Line! . . . Now, Robertson Wheels can handle broadly diversified grinding operations!

The addition of a line of resin-bonded wheels is the logical answer to our desire to give you a complete one-source grinding service.

We asked our engineers to produce a synthetic resin wheel as outstanding as the vitrified "Cool-Cut" and our related vitrified-bonded line . . . and they did it! Robertson Resin-Bonded Wheels can handle the toughest jobs; for instance, billet grinding, grinding in steel foundries, finishing welded products. They're perfect for snagging and cut-off operations, or for any job in which the wheel is subjected to unusual strain. And they're demons for work! Robertson Resin-Bonded Wheels are designed to operate at 9,500 s.f.p.m. on swing-frame and floor grinders. They can operate as high as 16,000 s.f.p.m., provided safety standards are followed. Speeds such as these spell economy where rapid stock removal is a "must."

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ROBERTSON COOL-CUT

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Resin-Bonded and Vitrified-Bonded Grinding Wheels, Mounted Wheels, Segments

USERS *Recommend Highly*

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
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Equal Efficiency of Every Unit Makes the Balanced Machine

We have proven conclusively in our shop that this new SUPER SERVICE Precision Drilling Machine, when used with an automatic spacing table, saves money, time and labor by eliminating jigs, bushings and fixtures. This 36-speed, 18-feed, 10 HP Machine is well recommended. This typical statement was made by a user of one of these new machines:

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Let us show you how your jobs can be economically processed on one of these machines.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

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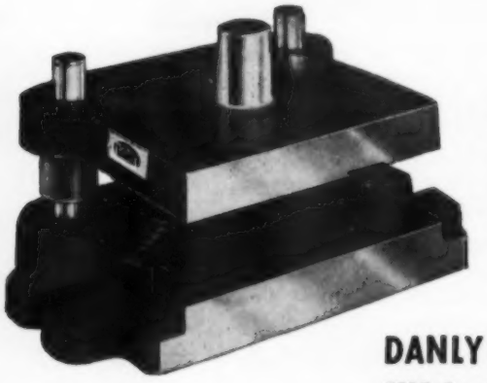
DANLY KNURLED SOCKET-HEAD CAP SCREWS save time and money. The mechanic can drive the knurled head a good part of the way before using the wrench. Infinite applications—a wide range of sizes.

DANLY KWIK-KLAMP TOGGLE CLAMPS combine strong construction and simplicity of operation—used wherever quick, positive clamping action is required.

DANLY DIE SPRINGS are noted for staying power and high resistance to fatigue. Two complete lines: *Medium Pressure—High Deflection; High Pressure—Medium Deflection.*

DANLY SOCKET-HEAD STRIPPER BOLTS. Made of high-grade steel, these stripper bolts have the same knurled socket-head found in Danly Cap Screws.



DANLY DIE SETS are famed for precision and known accuracy in Die Shops and Stamping Plants everywhere. Many types and sizes in Steel, and Semi-Steel.

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DANLY MACHINE SPECIALTIES, INC.

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Danly Tool, Die and Gage Makers' Supplies

SPOT NEWS OF METALWORKING

Many leases of former war plants have recapture clause allowing government to take them back. Among these plants are Mound Road plant of Ford at Detroit, North American Aviation plant of General Motors, Studebaker's aircraft engine plant at South Bend. Lessees are worrying about government taking back these plants to step up aircraft output.

New aluminum rod and bar mill will be built at Spokane, Wash., by Permanente Metals Corp. Mill will roll single aluminum ingot into a 3/8 in. rod over 2000 ft. long. Rod and bar production will lead to manufacture of wire, cable, screw machine stock, welding and brazing rod, rivet stock and flattened wire.

Sheet steel flash rings are being used by a midwestern manufacturer for casting bearing surfaces on steel sleeves. The application is reported eminently successful.

All new steel dies used in drawing brass parts for radiator tanks and similar parts are of the "pinch-off" type, so that the part is formed complete from the blank at one stroke of the punch and also is trimmed to size. Finished piece and scrap come out of the machine at one stroke of the press.

Over 15,000 new freight cars were put in service by railroads in January and February, compared with 4232 in same period last year. Retirements of old cars totaled 14,750 units. Carriers have on order 122,000 cars and 1600 locomotives, of which 1486 are diesels.

Labor conciliators in Washington are not so sure about peaceful third-round wage settlements this spring. They fear that John L. Lewis may have started something. Also, manufacturers are stiffening in their resistance to wage increases.

> **It is safe guess that industry is not going to stop making refrigerators, automobiles and other civilian goods day after tomorrow. Big new government orders are not for the asking, except for planes. Extra load on industry shapes up to couple of billions, mostly for air power. That's not trivial, but is long way from wartime $60 billions.**

British built 287,000 cars and 158,000 commercial vehicles in 1947, reaching the prewar figure. Exports took 64% of passenger cars and 37% of commercial units the last three months of the year. British Empire countries got 60,000 units, Belgium 12,000, while Switzerland, Sweden, Portugal and Holland accounted for 20,700.

One motor car maker intends to cadmium plate steel radiator parts instead of tinning them. The bond is said to be just as good when properly soldered. Moreover, 90% of tin used to prepare parts for soldering to core of radiator is wasted.

A 60,000-ton hydraulic press is being built to make aluminum forgings for airplane wing spar caps. Germans constructed a 30,000-ton press during war for aircraft work.

General Motors bigwigs and top United Electrical Workers' officials have been meeting privately to discuss third-round demands. Last two years the GM automotive wage pattern has been set by GM-UE agreement which preceded GM-UAW contract settlements.

New international trade twist: Ford of Canada is shipping V-8 cylinder castings to Dearborn for use in U.S.-built cars. Two-way benefit results—pressure on Ford foundry at Rouge is eased, and Ford of Canada gets precious dollar exchange.

A Bureau of Labor Statistics study of average hourly wage rates paid tool and die makers in 12 major cities shows the highest average, $2.10, in Detroit. The lowest was $1.58 in Hartford, Conn.

Gaging Metalworking

American Machinist INDEX of METALWORKING PRODUCTION		COMPONENTS				
		MACHINERY	ELECTRICAL MACHINERY	AUTOS, TRUCKS	TRANSPORTATION EQUIPMENT	OTHER METALWORKING
FEBRUARY 1948	227	250	239	238	289	156
JANUARY	227	248	242	238	294	156
DECEMBER 1947	226	247	245	235	293	156
NOVEMBER	223	244	244	227	293	154
OCTOBER	221	243	240	227	284	151
SEPTEMBER	216	240	234	225	268	145
AUGUST	206	233	224	206	259	142
JULY	206	230	226	212	261	141
JUNE	217	239	232	218	305	147
MAY	214	241	223	205	307	148
APRIL	219	241	229	220	310	151
MARCH	222	239	244	224	305	153
FEBRUARY 1947	218	236	242	217	304	151

Aircraft Program To Boost Metalworking

The nation's metalworking industries, already operating at a peacetime high, will soar further as the proposed aircraft production program gets under way. Even a modest boost in defense output will be felt quickly in certain metalworking segments.

▸ For one, machine tool builders and allied machinery makers will be called upon to help retool airplane and aircraft parts factories. To support an air force of the size contemplated, at least 3000 military planes will be required each year. The Navy probably will need 2500 in addition.

▸ Though small by wartime standards, a program of this size would mean tripling production. The aircraft industry built 1330 military planes in 1946, 1800 in 1947, and received funds to manufacture 1511 during fiscal 1948.

New Aircraft Tooling Needed

Because many of today's military planes are obsolete, rebuilding the Air Force will demand new tooling on a large scale. Many of the types making up the 28,307 planes in the Air Force, of which 14,091 are in storage, are obsolete. New and advanced engines in particular necessitate new tooling. The machine tool industry should feel the effects of this tooling program in the near future.

▸ Employment lately in machine shops and foundries in the Pacific Northwest has attained a seasonal peak, partly because of a stir in aircraft. Boeing, biggest single employer in the area, is maintaining a payroll of 17,000 and, even without the stepped-up military schedule, expects to continue on the present basis throughout the year. It completed eight B-50 bombers in February and soon will roll out its doors the first of 55 Stratocruisers.

No Boom in Prospect

But the expanding appropriations for military aircraft should not fool the metalworking industries into the belief that a return to a seller's market is in the cards for the immediate future. The programs will not be big enough to guarantee booming business. Even in machine tools there should be lots of capacity unaffected; tooling orders will hit the industry only in spots. There will be nothing remotely resembling a return to wartime conditions.

▸ A prolonged coal stoppage, which would cut back steel production seriously, would do much more to spur inflationary pressures on metalworking prices than the aircraft program will.

Employment at Peak

Employment continues to shatter records. Despite temporary layoffs traceable to bad weather, February saw more than 57 million civilians employed, a gain of 1.6 million over a year ago. The country's total labor force, in fact, is 1.8 million higher than 12 months ago. The increase comes from the larger population, entry of about 1 million veterans into the working force, and an upturn in the number of women at work.

Metalworking Barely Holds Own

If metalworking production held its own in March, in the face of shutdowns for retooling at Ford and other slackness here and there, it did well. Final figures for February revealed an operating rate of 227 on the American Machinist Index of Metalworking Production. The index was unchanged from January and compared with 218 in February of last year. Among the components, the machinery group went up 2 points to 250. On the other hand, transportation equipment (excluding automobiles) and electrical machinery dropped 5 points and 3 points respectively.

Capital Goods Orders Lag

New orders for capital goods, which were moving upward at the beginning of the year, are reversing the trend. The dip is not serious, but coupled with another decline in new orders for consumers' durable goods, it underlines the fact that tough competition is returning.

▸ One should not be blind to the truth that, apart from a defense production shot-in-the-arm, metalworking soon may be in for some decline in business. It doesn't show up yet in production, except in a limited number of spots. But investigation discloses that backlogs are shrinking in many segments of metalworking; new orders are coming in at a rate lower than current output.

Watchful Waiting Attitude Prevails

Scarcely ever have so many important factors converged at one time to give a sense of uncertainty to the metalworking situation. So far as prices are concerned, as one buyer put it, "a heavy lull hangs over the scene." Management is waiting for the outcome of the coal strike, of the controversy over third-round wage increases, of tax adjustments, of ERP and of the government's aggressive foreign policy.

▸ Watchful waiting sums up the attitude of most big companies. In buying materials, they are moving cautiously and are sidestepping long-term firm commitments wherever possible.

▸ Most of the new contracts being made by one big metalworking manufacturer, for example, cover requirements without a definite quantity commitment. Usually the contracts protect the company against a price decline and contain cancellation privileges. This represents a turn-around from conditions not long ago.

Coal Strike To Hit Car Output

Everyone in Detroit knows that the coal strike inevitably means a steel shortage within 60 days or less. That in turn spells fewer automobiles coming off assembly lines. Roughly, it is estimated that every week of the strike will result in 100,000 less cars this year. Practically every car maker is working hand-to-mouth on steel; and any steel curtailment will be felt almost instantly in reduced car production.

Other metalworking groups, notably electrical goods manufacturers, are apprehensive that their steel tonnage will be adversely affected by the coal strike.

To Our Readers

Unsettled relations between printers with whom we deal and certain of their employees have forced us to use some substitute methods in producing this issue. The results of these deviations from normal may be visible to you. If the printing emergency persists, we may have to resort to still more apparent substitutes. But we intend to let nothing which we can now foresee stop us from bringing to you full-length, clear and typographically pleasing issues.

Construction Machinery Demand Heavy

Construction and mining machinery makers are going full blast and should stay at current high levels indefinitely. Many plants are running at or near full capacity. Shortages of some machinery items are likely to persist, because output cannot be stretched beyond present limits without adding to plant facilities. Few employers are willing to undertake expansion because of the scarcity of materials.

▸ Companies making oil field machinery are very busy. The extraordinary domestic demand is likely to continue. Exports should be stimulated by the European recovery program.

Industrial Equipment Sales Soar

Reports from the Chicago area indicate that industrial equipment sales have either kept abreast of those a year ago or have surpassed them. Producers of gasoline and diesel power units for industrial use say that orders are ahead of the 1947 volume.

▸ Makers of motors, pumps, generators and diesel-electric locomotives insist that a comfortable gain has been registered over the previous year. Electric cranes, foundry equipment and hoists are in good demand.

Cutting Tool Demand Down

Cutting tool manufacturers are doing a reasonably good business, but their volume has been pared by the tendency of many customers to reduce inventories and meet a portion of current needs from accumulated stocks. The outlook is not too encouraging. There has been a general leveling off of cutting tool orders for more than a year.

Machine Tool Orders Decline

Machine tool business has slumped a bit, particularly in the case of companies which recently raised prices and allowed customers to place large orders before the increases took effect.

▸ Never has pending business in peacetime been much bigger than now. But many buyers are holding off to see what is going to happen. The outlook is muddied by the rapid filling of pipelines in consumer goods and by the sudden veering of Washington toward an aircraft procurement program.

▸ It is too early and too little is known to appraise accurately the demand for machine tools for aircraft production. Nevertheless, it is safe to guess that orders for special high-production machines will be considerably increased.

February Shipments Up

New machine tool orders received during February stood at 134.9 on the index of the National Machine Tool Builders' Association (1939 equals 100). This figure represents a sharp drop from 146.3 in January. Shipments, on the other hand, rose substantially from 132.9 during January 153.1 in February. The backlog of the industry declined to 689.3 for February from 715.6 in January. All of the February figures are preliminary and subject to revision when all the returns are in.

Auto Outlook Firm

Firmness of used-car prices indicate that the automobile industry will not have to fight for business this summer. During the winter prices on second-hand vehicles eased off as the usual slowness developed in automobile buying. With Spring, however, the steadily firming prices were contrary to general belief. It has been felt for sometime that as new autos flowed into the market the used car lots would feel a pinch. It is evident that many prospective new-car buyers are a little slow to snap up the higher-priced jobs and show rooms reveal a preponderance of classy town-and-farm wagons as well as the big cars.

Canadian Aluminum Helping

Shipments of Canadian aluminum are materially aiding the domestic situation, but have not slashed into the tremendous backlogs in sheet. Increased die-casting, substitution for steel and a general study by manufacturers in the use of the lighter metal are pushing delivery dates further forward. Opening of new plants on the Pacific Coast is expected to help alleviate the situation, but not for another year.

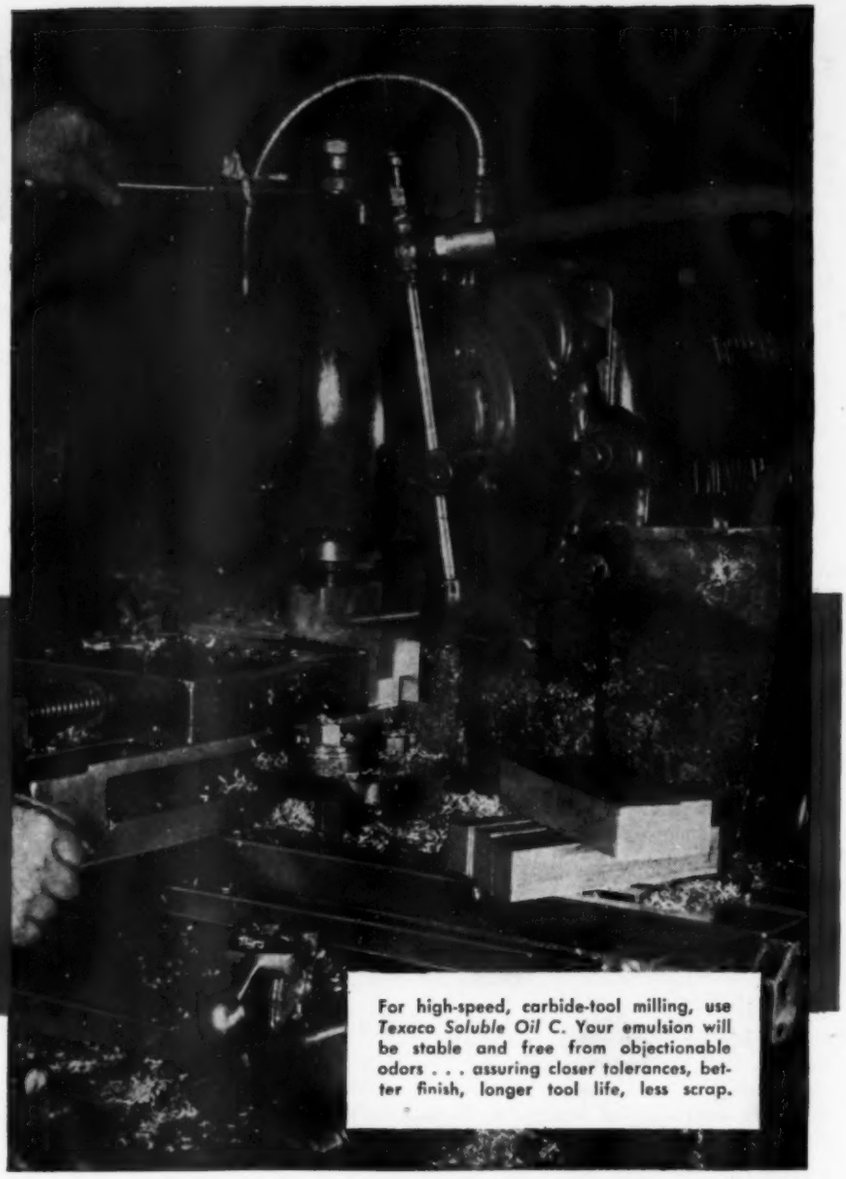
Brass Demand Eases

Despite steel and aluminum shortages, the brass industry is slowing up slightly. Sheet, bar and shapes are not difficult to obtain. Small tubing is the critical item. Some of the larger mills are operating on a six-day basis to meet domestic and military demand for tubing.

NOW!

SOLUBLE OIL THAT PREVENTS

"MONDAY MORNING ODOR"



For high-speed, carbide-tool milling, use *Texaco Soluble Oil C*. Your emulsion will be stable and free from objectionable odors . . . assuring closer tolerances, better finish, longer tool life, less scrap.

Proved in Hundreds of Plants

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

The "Easy Coasting" Era Is Over

Machine tool users are sold only 25% of the new equipment which they buy. They merely place orders for the remaining 75%.

This statement may appear startling at first glance. But think about it and its truth will sink in.

The machine tool industry is comprised of men who primarily have been designers and builders of new machines. On the selling side, they have been order-takers.

In a preponderance of cases, machine tool companies wait for a user to announce that he is "in the market" for a new machine. They do little if anything to create business.

Too few times the machine tool salesman goes into a customer's plant, studies his production problems, and comes up with a cost-saving idea whereby new machines replacing old will be profitable.

The nation's metalworking shops teem with opportunities for such studies. And every customer who respects the ability of the machine tool salesman will welcome his help.

But how many salesmen take advantage of these opportunities? And how many of them are trained to do it?

One of the reasons why more aggressive, hard-hitting selling is not done is the "easy coasting" which became prevalent during the war. It could almost be classed as a communicable disease which one salesman got from another.

Fortunately it is curable, though sometimes drastic "penicillin shots" must be given. Some companies have been in the process lately of injecting these "penicillin shots" into their sales forces.

The point is that the machine tool industry has long been in a buyer's market, though the indifference of some sales staffs would never lead one to guess it.

It is time that a high-powered job of selling be undertaken if the industry is to survive on a healthy basis. American industry can use with great profit the products of the machine tool industry. Surely the production executives and the "front offices" can be sold this fact.

It is most appropriate, then, that the National Machine Tool Builders' Association devote an entire session of its spring meeting to a discussion of sales techniques.

And it is very timely that the association, in cooperation with the American Machine Tool Distributors' Association, should sponsor a refresher course in sales engineering at Cornell University this summer.

During the war, the machine tool industry was swamped with orders, and production was the problem. Now the situation is in reverse. There is plenty of capacity, but orders are slack.

There are two good reasons why selling today is the paramount worry of machine tool builders. One, purely selfish, is the desire to prosper and make money. The other is much broader. A sound, strong machine tool industry is essential to America if our economy is to continue to have an edge on that of other countries and if we are to be prepared to defend ourselves in an emergency.

Burnham Finney

EDITOR

*A Hogging Demonstration.

HOGGING!

No shaper hogs off metal without power at the cutting tool or without rigidity or without an overall ability to stand the gaff.

Cincinnati Heavy Duty Shapers, outstanding for many years in power, stamina and sustained performance, are today more powerful and more rigid than before.

The reliable performance of Cincinnati Heavy Duty Shapers means profit in the shop.

Write for catalog N-3 on the complete line of Cincinnati Shapers.

*This Cincinnati Heavy Duty Shaper operated for the 10 days of the Machine Tool Show on a 2" depth of cut, .030" feed, and nine strokes per minute—in 1020 Steel to show the remarkable cutting capacity and rigidity of Cincinnati Shapers.

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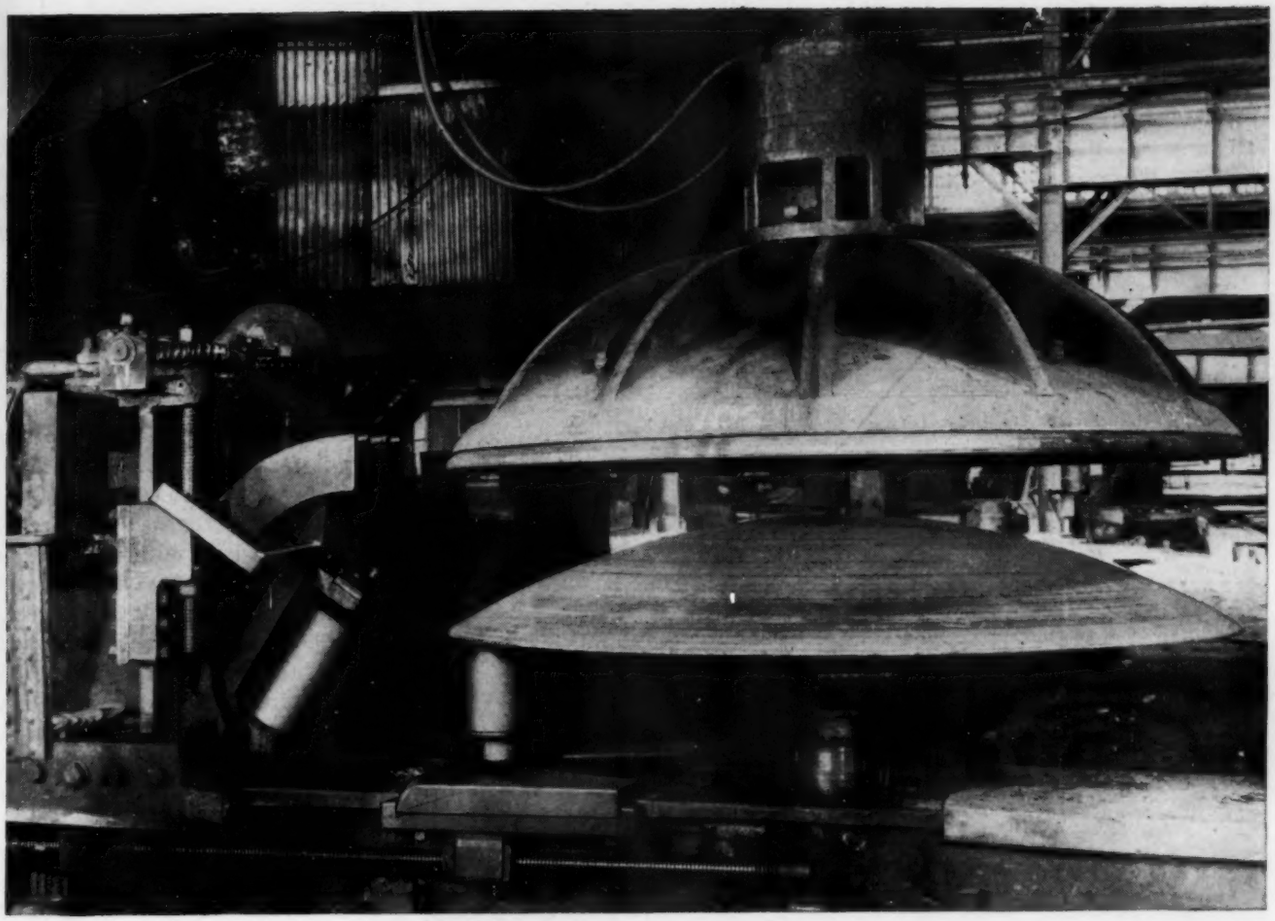


SPINNING MACHINE, showing the arrangement of the upper and lower formers and the inner and outer forming rollers. Adjusting screw for inner roller is visible at the bottom. Curved guides at left permit accurate adjustment of outer roller

SPIN 6-IN. THICK STEEL PLATE

Elliptically dished tank heads are formed by spinning steel plate in thicknesses up to 6 in. and diameters as large as 18 ft.

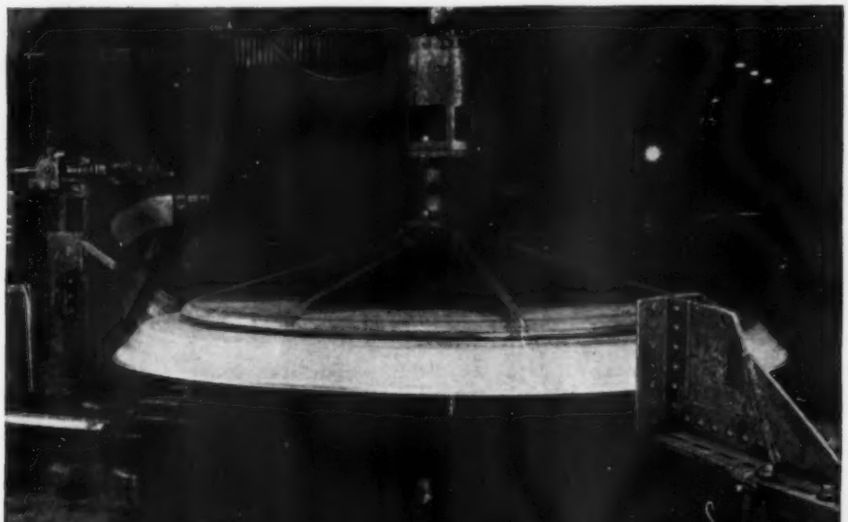
PRODUCTION of light-gage sheet-metal parts by spinning is a common manufacturing process, but the application by Lukens Steel Co. of this same technique to steel plate, up to 6 in. thick, marks an unusual departure from the commonly accepted limitations. The machines used are of the vertical-spindle type, similar in appearance to a four-post vertical press. The flat circular plate to be spun is held between upper and lower formers which have concave and convex shapes respectively, and are made from cast iron, cast steel, or steel plate. As there is no relative movement between these and the workpiece, the surfaces are not machined unless the specified tolerances of the finished part require it. The upper former is attached to a vertical hydraulic ram and the lower former to a vertical-spindle jack rotated by an electric motor and gear train at 20 or 46 rpm. Pressure between the formers is adjustable to 166 tons to suit the job.

Centering of the hot disk is performed by four vertical rollers mounted on cast-iron supports that slide radially from the corners toward the center of the machine. They are geared together so each moves in or out an equal amount.

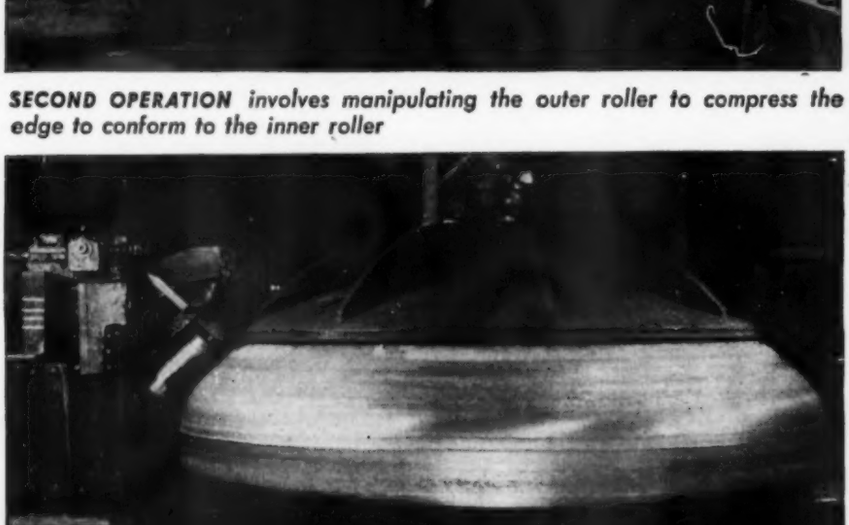
The outer forming roller is cylindrical, and floats on a water-cooled bronze bearing. It is rotated by contact with the work and is adjustable by motor-driven gears either vertically, horizontally, or through an arc of slightly less than 180°.

The inner roller is mounted on a separate screw-operated apron, and its position with respect to the

***FIRST OPERATION** is to compress the heated disk between upper and lower formers*



***SECOND OPERATION** involves manipulating the outer roller to compress the edge to conform to the inner roller*



***ELLIPTICAL** dished head after completion of the spinning operation in the Lukens Steel plant*

work is adjustable. Once set to the position necessary for the size of part being spun, its position is not changed. It has the shape of the inner corner radius and flange of the part, and is also rotated by contact with the work. Both inner and outer rollers are cast steel, and have a relatively short life.

In operation, the top former is lowered, compressing the hot plate against the lower former and producing the crowned shape. Usually, two changes of formers are necessary to complete a part. The edge is formed by the outer roller compressing the metal against the inner roller.

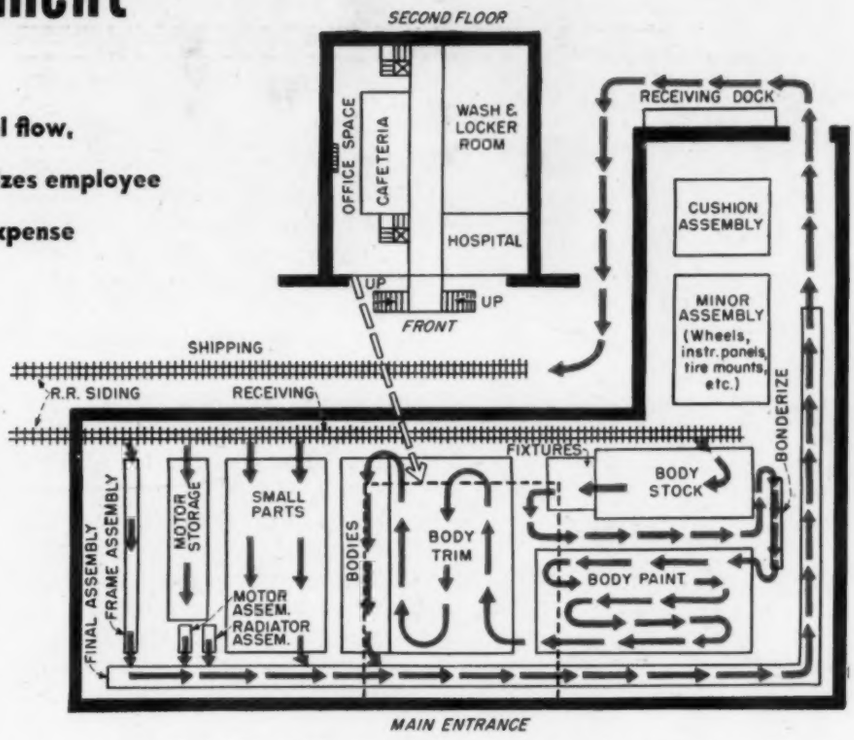
Gaging is done with a steel tape clipped to the edge of the part and stretched around the circumference with the machine stopped. Called a "hot tape," this tape is compared with a cold tape to correct for expansion. Scale is removed from the work by a combination of centrifugal force and air blasts.

Now nearing completion is a new flanging machine which will enable Lukens to spin heads even larger than 18 ft. 2½ in.

SPUN HEAD weighing 25,000 lb. was flame cut from two plates 127x254 in. welded together. Finished O. D. is 218½ in.; over-all depth, 49 7/32 in.; minimum thickness, 1½ in.

Layout Controls Material and Man Movement

Plant layout controls material flow, regulates worker movement, localizes employee activities and reduces the guard expense



Layout of Lincoln-Mercury plant at Los Angeles was planned to attain a smooth material flow through processing and assembly and at the same time to provide one front entrance and service facilities for employees on a second floor over the central part of the building

CONTRIBUTIONS of modern plant layout to manufacturing efficiency are manifold. Foremost among them is control of material movement as it is received, processed and shipped as finished product. A second extremely important one, not yet fully realized in most plants or acknowledged by some layout engineers, is a corresponding guidance, or regulation, of employees.

The Ford Motor Car Co., in building its new Lincoln-Mercury plant in Los Angeles, has taken cognizance of both these factors and planned accordingly, as the layout shows.

The plant, for which ground was broken in Dec., 1945, is roughly 800 ft. long and 300 ft. wide, with a 200x300-ft. extra bay in the rear. Expected production rate will be 250 automobiles per day—50 on two Lincoln lines and 200 of one Mercury line at first, later two. This plant will supply the eleven Western states and export some cars to Mexico and the Hawaiian Islands.

The production area is planned to eliminate back-tracking and utilize materials-handling equipment to its fullest degree. Most incoming stock is brought into the building on a railroad siding. Frames pass down their subassembly line to the final-assembly line running lengthwise of the building. Next to the frame line are motor storage and the motor and radiator lines, also leading at right angles into the final line. Small-part subassembly is also located cross-wise of the plant, so stock flows from receiving direct to final assembly.

Body stock, unloaded right at its storage area, is processed through fixtures, back to bonderizing, through paint and dry in modern spray booths and ovens, through body trim and finally to body storage. From here, bodies are transferred, as needed, to the assembly line.

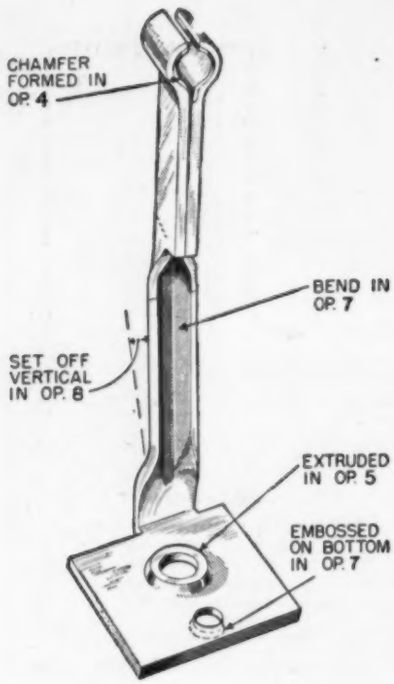
Nearly completed automobiles now pass through the rear bay, where minor assemblies (wheels, instrument panels, etc.) and cushions are added, before they are driven off the assembly line for rail shipment or drive-away delivery. A material flow approaching the ideal is thus obtained, with stock brought in one side of the plant and moving more or less straight across to the final-assembly line and out the door.

Movement of workers into and out of the plant is also controllable to a large extent if it is possible to use only one entrance. With a total of only 1,500 employees as at this plant, this can well be done. A front entrance leading to the second floor is used by all factory workers. This front-entrance arrangement conveys to employees an expression of the respect in which they are held by the management.

The single entrance also reduces guard expense, facilitates administration and makes possible the localization of employee activities and services where all must pass. Wash and locker rooms, hospital and cafeteria are located immediately adjacent to the entrance on the second floor from which stairways lead to working areas.

PROGRESSIVE DIE SLASHES TOOLING

Seventeen operations completed on 1400 parts per min:; scrap totals only 0.0818 sq. in.



TOOL SHOPS are being flooded with part prints of products and the question: "Can you manufacture a die which will ccmplete this job in one operation?" As a result, die manufacturers are being forced more and more into design work.

Typical of this trend is a 9-station progressive die to produce terminals for fluorescent lamp sockets. In original production of this terminal, several dies and machining operations were necessary. Then, to reduce operations, a die to produce one part was made to do the 17 operations. After bugs were ironed out, a progressive tool to make two parts at one time and to reduce scrap to a minimum was in order.

From a strip of brass 2 11/16 in. wide, the scrap loss for each part was cut to two piercings of roughly 3/16 x 1 16 in. and ¼ x ⅛ in., respectively.

A four-pillar die set was selected for use in a 25-ton Henry & Wright press capable of better than 700 strokes per minute. Over the piercing position for four rectangular guttings, a combination fixed stripper and setedge was used. For the remaining eight stations, a spring-loaded stripper plate on the top die was utilized According to the manufacturer, the fixed stripper should have been eliminated and a 9-station spring-loaded stripper used on the punch plate. This would have kept the bottom die fully open and would have made it easier to start strips through.

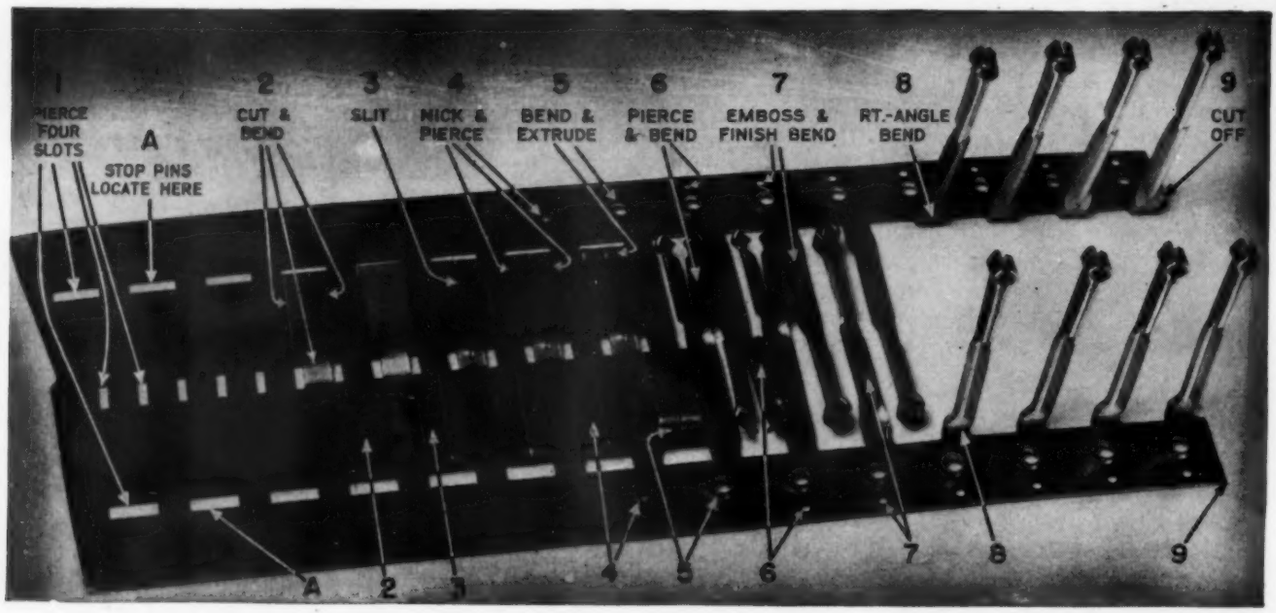
Pickup, or stop, pins immediately follow the two larger slotting punches on the outside edge of the strip. To start the stock through, it is necessary to push it up to the pins, and hold it there until the first blow is struck.

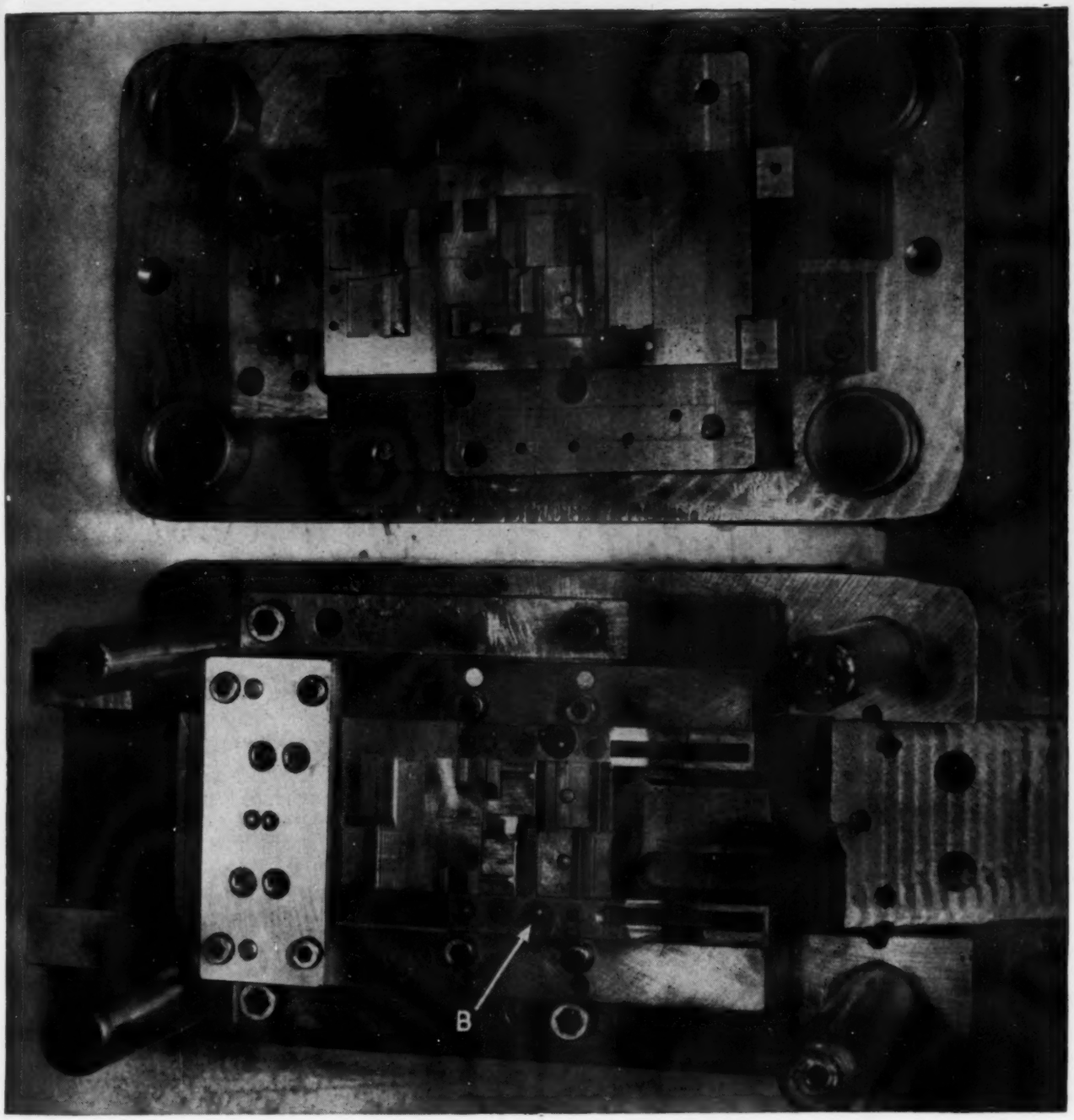
Operations are:

1. Pierce four slots. Punches are stripped by fixed plate on bottom die.

2. Cut rectangular pad and bend throat.

Brass Terminal for fluorescent light socket (above) is shown in various stages of production in the scrap strip. Looking at the strip from the bottom, embossing on small, outside hole is not visible. To facilitate manufacture of the progressive die, despite segmentation, it was necessary to skip two blanks between operations 1 and 2 ,one between 2 and 3, 3 and 4, 6 and 7, 7 and 8, and four between 8 and 9. The only waste on the 2 11/16-in. wide brass strip is the four piercings for each pair of parts. All operations are in pairs on opposite sides of the strip





Seventeen operations are done on two parts at a time in this nine-station, progressive die. Bushings are used for all piercings and extrusions and the die is made in segments. A fixed stripper handles four piercing punches in the first operation. Two stop pins follow the two outside piercing punches. The other stations are stripped by a spring-loaded stripper plate in the upper die. To lift the extrusion from the bottom die, two spring-loaded, disappearing pins (B) are used in the clearance holes for operation 6. A four-pillar die set on a 25-ton Henry & Wright press of 700 strokes per minute with a roll feed

3. Slit pad without breaking through end.

4. Nick two outside edges of pad and pierce hole for extrusion.

5. Bend radius on end of pad and extrude hole.

6. Pierce outside hole and form first V. In this operation the clearance hole for the extrusion in the previous operation contains a spring-loaded, disappearing plunger which strips extrusion from bottom die. As the V is bent, the small section of metal not slit on pad in operation 3 is torn as the piece starts to close.

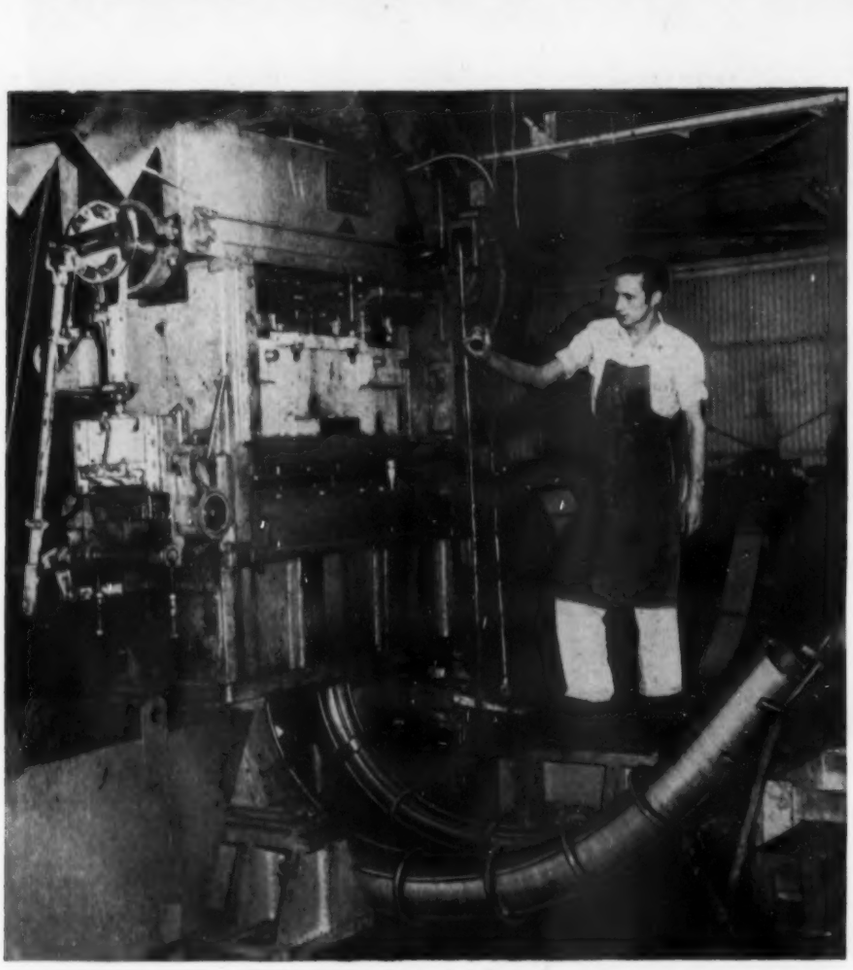
7. Finish closing two flaps by forming second V in stem next to base and emboss top of pierced hole. Embossing is accomplished by a cone-shaped punch.

8. Bend stem to right angle to base downward and slightly off of the vertical centerline. This is done by slots cut in punch which are not on center in relation to the blank.

9. Cut off part.

Material for this article was supplied by Andrew J. Young & Sons, Meriden, Conn., builder of the progressive die, and Lloyd Products Co., Providence, R. I., for whom the die was built.

CURVED CHUTES AID WORK EJECTION



Rotor and stator laminations are punched at a rate of 8,000 per hr. on a high-speed Bliss 645D press equipped with double-roll feed and scrap cutter. Two curved chutes which carry ejected laminations from die are set under the press which must be elevated from floor to accommodate the chutes

Lamination punching on 5-stage progressive die needs good work-handling means to take advantage of its full capacity

BY HARRY S. WHAREN

ASSOCIATE EDITOR

HIGH PRODUCTIVITY in the stamping shop depends, first on dies and next on work-handling means. Both may limit each other so sorely that good die design may be made meaningless and work-handling equipment worthless.

But many times it is far easier to design and build a high-production die than it is to devise an adequate work ejector. The latter all too often limits production by the die, especially when parts must be protected against nicks or burrs and, at the same time, be ejected into orderly piles.

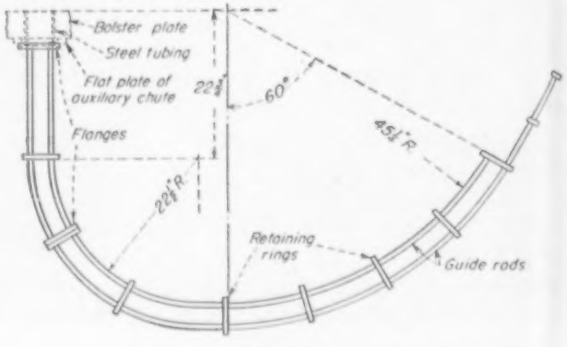
While gravity ejection is practical and cheap for the ordinary run of parts, it has not proved satisfactory for electric-motor rotor and stator laminations. When follow dies stamp out laminations, ejection by positive action is preferable to eliminate, as far as possible, any danger of jamming of punchings in the die and die breakage.

At the A. O. Smith Electrical Mfg. Co., Los Angeles, this work-handling problem was solved by construction of chutes into which lamination punchings are forced by punch pressure. Two skeleton chutes, one for rotor laminations and the other for stator laminations, are attached to the under side of the press bolster.

The press itself is set up, for use of coil stock, with a double-roll feed passing stock through successive stages of a five-stage progressive die. Scrap is carried out of the die by the outgoing roll-feed unit and into a scrap cutter.

As rotor and stator laminations are punched, they are ejected into the chutes by positive action. This requires a back pressure to balance partially the punch pressure so blanks do not drop away from the die.

Otherwise, succeeding blanks might cock over in the lower part where greater clearance is given and so jam the chute. Or a blank might stick in the die and act as a diaphragm with a backward spring action, causing succeeding blanks to build up, catch the strip, jam the die and break it.



Rotor-lamination chute, constructed of four guide rods spaced apart by retaining rings, has a vertical straight section at entry end, followed by curved sections. Weight of laminations on upcurved section effects a back pressure that keeps the chute full and prevents blanks jamming in the chute

Required back pressure is obtained by curving the chutes so blanks feed up an incline. Pressure from their weight is then transmitted backward through succeeding blanks. Curve and height of chutes are critical to give the balancing pressure needed for positive ejection.

The rotor-lamination chute is built up of four ⅝-in. guide rods, the inner two being 8 ft. 10 in. long and the outer two 9 ft. 7 in. long. It holds nearly 5,000 laminations when loaded. Entry end of the chute is straight to the first retaining ring, then curved with different radii to the exit end which again is a straight section.

Additional retaining rings, spaced along the chute to hold guide rods in place, are tackwelded to rods along outer surfaces only as inner surfaces of rods must be kept clear so punchings can slide along easily.

A flange at the entry end has four bolt holes for fastening it to a small auxiliary guide chute bolted underneath the press bolster plate. The small chute has, welded to a flat plate, a piece of steel tubing that makes a sliding fit with the inside bore of the flange. The bolster itself has a cutout to receive the other end of the tubing which extends up to the bottom of the die.

When a different size of lamination is to be run, the chute must be disengaged and replaced by one of proper size. Sometimes, a chute can be used for smaller laminations if they do not drop too low and catch on the retaining rings.

The removed chute is never unloaded, as doing so would mean loss of entire back pressure and plenty of trouble in setting up the job the next time.

The upper part of the chute, however, is unloaded, and a wood plug put in and carried through the chute with the laminations when the job is again set up in the press. The plug looks like a dumb-bell with flat disks replacing the balls. The disks are split in half and spring-loaded, so back pressure is simulated by friction of disks with guide rods of the chute.

Typical of the progressive dies with which these chutes are used is the 5-stage die for punching rotor laminations of 3.750-in. dia. and stator laminations of 6.175-in. dia. This die is capable of punching 12,000 parts per hr. at 100 strokes per min., as two laminations are produced at each stroke.

Allowing for downtime for reel changing and other unavoidable delays, actual production is about 8,000 punchings per hr. when using coil stock.

The die, which is made of high-carbon, high-chromium tool steel, blanks out rotor laminations in the first two stages and stator laminations in the last three stages. Stage 1 punches rotor slots, center hole and two pilot holes at the edge of the strip. Stage 2 blanks out the rotor lamination and pierces rivet holes for the stator lamination. Stage 3 punches stator slots, stage 4 pierces four bolt clearance holes and the witness hole, and stage 5 blanks out the stator.

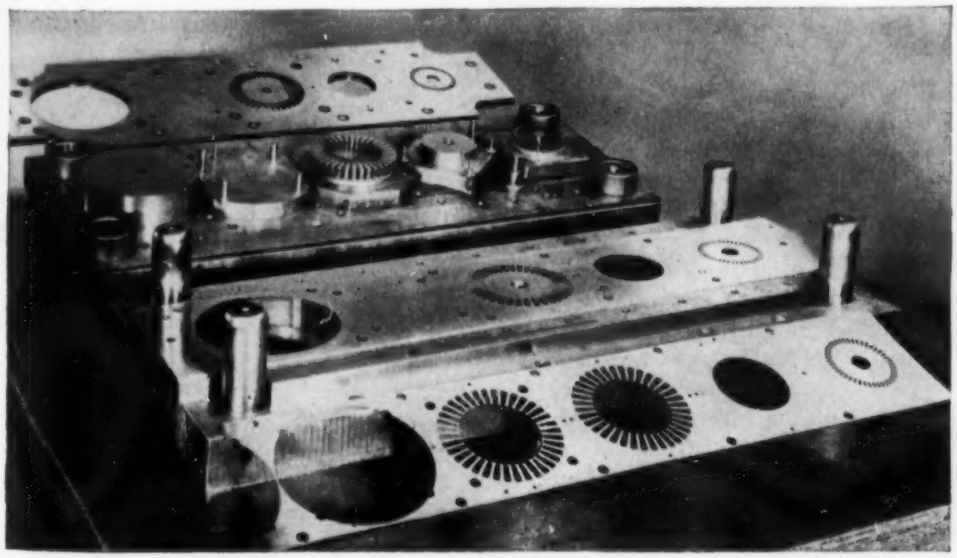
Blanking and hole-piercing punches are similar to those in common use. But the slot-piercing punches and dies are built up of a series of ground pieces.

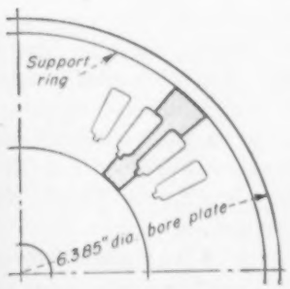
Segmental construction allows accurate grinding of the pieces on small surface-grinder fixtures that take several such pieces at a time. It also enables tolerances of 0.0001 in. to be held on slot spacing.

In the first stage, two pilot holes are pierced in the strip. At the following stages, pilot pins in the punch (but not shown in the die photograph) match pilot holes in the die for exact stock location. Each pilot pin has a spring-supported stripper to avoid jams that could otherwise occur with slight misfeeds if the die were equipped with a strip guide.

The die itself has no shear, being ground flat over its entire face. The punch is given a 1/16-in. shear from end to end.

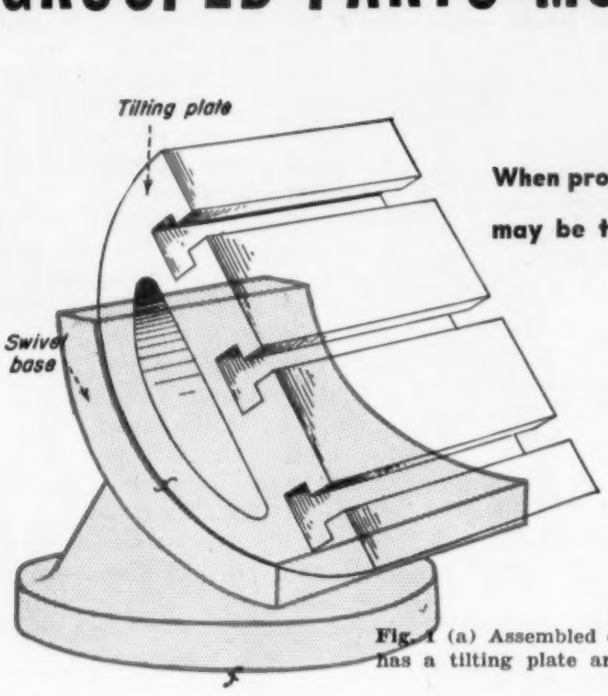
Clearance between dies and punches originally is only a 5-min. angle. This small amount, which equals about 0.002 in. in the 1⅜-in. thickness, permits using the die from its original 1⅜ in. to 9/16 in. New punches are then fitted and used until the die is worn out at about 3/16 to ¼ in. in thickness, giving a possible die life of 4,000,000 hits.





Progressive die set blanks out rotor laminations in stage 2 (second from right) and stator laminations in stage 5. Dies for slot punching are built up of ground pieces shrunk into a supporting ring that fits into the die block. The sketch shows how each piece forms cutting edges

GROUPED PARTS MULTIPLE-MACHINED



When production runs are not too high, semi-toolroom practice may be the answer with parts grouped on low-cost fixtures

Fig. 1 (a) Assembled compound-angle plate, has a tilting plate and swivel base

BY F. H. SCRIBER

COST OF PRODUCTION depends on part design and tooling. The latter, in turn, depends on the quantity of parts to be manufactured, because tooling can be made only as efficient and economical as the production run warrants.

To the following problem—machining swivel bases—a general approach is indicated with no attempt made to go into operational or tooling detail. Methods are semi-toolroom production in which enough units are machined at one time to take care of perhaps a year's requirements, with practical economy substituted for mass production.

Fig. 1 (*a*) shows an assembly of a tilting plate mounted in the circular seat of a swivel base. The plate can be clamped in various angular positions, while the base can be swiveled upon another plate set horizontally (not shown) so work to be machined can be set up at plain or compound angles.

Fig. 1 (*b*) shows four bases grouped together around a central hub so they may be economically machined as one unit and cut apart to form individual bases. Each section is then the same as that shown in the assembled view.

Two sets of operations are performed on these parts: those that lend themselves to machining as a group and those that are better done after the four units have been separated. Figs. 2 and 3 show how the large hole is bored and how the four feet are machined to dimension *D* (Fig. 1).

The lower end of the hub of the four-unit casting sits on three beveled blocks (Fig. 2) which center that end from the outside diameter. Four lower screws are brought into contact with the lower end of the hub, care being taken not to disturb the centralized setting in the V plates.

Four upper screws are next brought into contact with the upper end of the hub, and a test is made to see if the outer diameter of the hub at its upper end runs reasonably true. If not, adjustments are made on the four upper screws and all screws now tightened securely. A driving pin counteracts any tendency of the work to move in the fixture against the strains set up by the boring operation.

With the base revolving in the direction indicated by the arrow, the hole is rough- and finish-bored, while in the same setup the upper end of the hub is faced. The next operation, facing the lower end of the hub, is done in the boring machine on another setup. This fixture consists of a plain plate and a centralizing post over

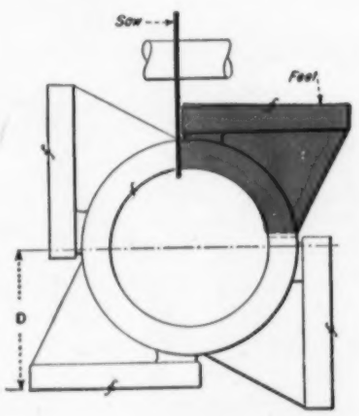


Fig. 1 (b) Four bases are grouped for multiple machining, as a unit, of center hole and four feet, followed by sawing apart in milling machine

which the work is set with the lower end up.

The four feet (Fig. 3) are machined with each surface treated as a separate operation. The casting is placed over an arbor in a knee-type of fixture. The arbor is attached to the body by six screws equally spaced around the flange of the stud-like arbor, and the work is held by a clamp, in the form of a circular plate, slipped over the stud.

A locating plate provides radial location of the underside of the foot below the surface to be machined, while a locating screw with a hand knob locks the work radially against the locating plate. Each surface is then machined in a shaper. At this time also, a groove (not shown) is cut in the upper surface.

After roughing, finishing and grooving of one surface is completed, the work is reclamped in the fixture with another of the four surfaces in position to be machined. This sequence is continued until all four feet have been finished.

For cutting the four sections apart, a somewhat similar fixture is used. The units, however, are clamped individually so, when severed, they will not fall apart. The cutting saw indicated in Fig. 1 performs this final operation in a milling machine.

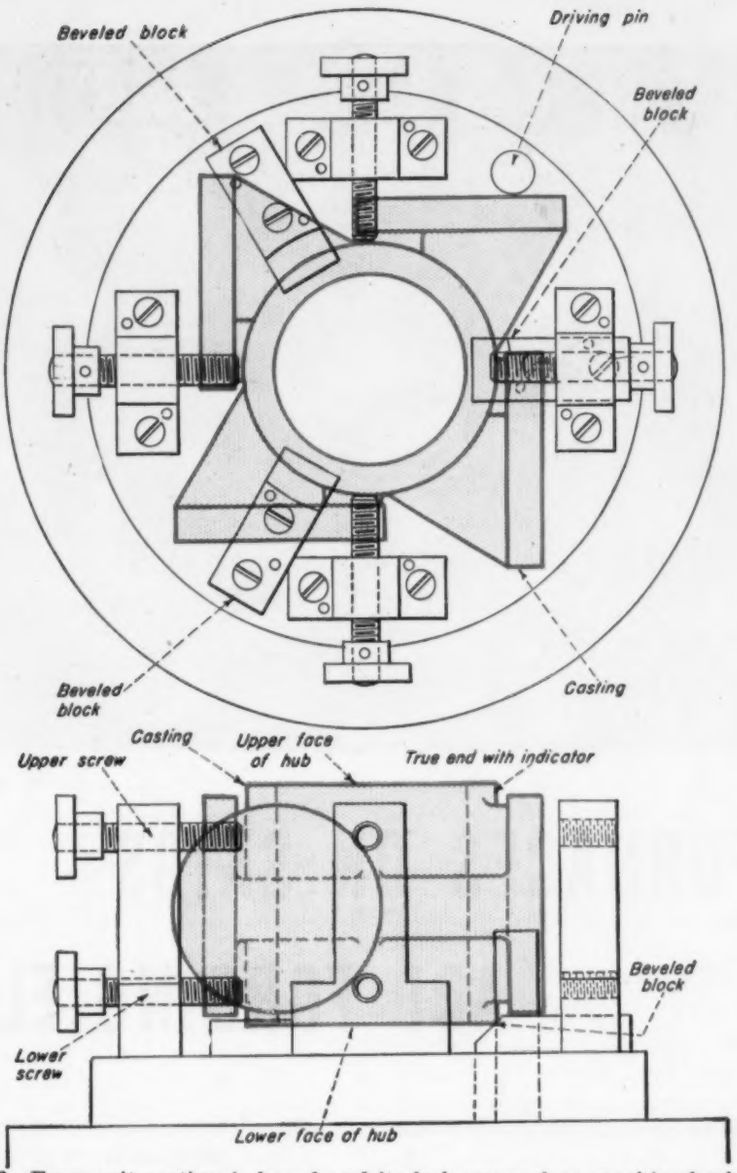
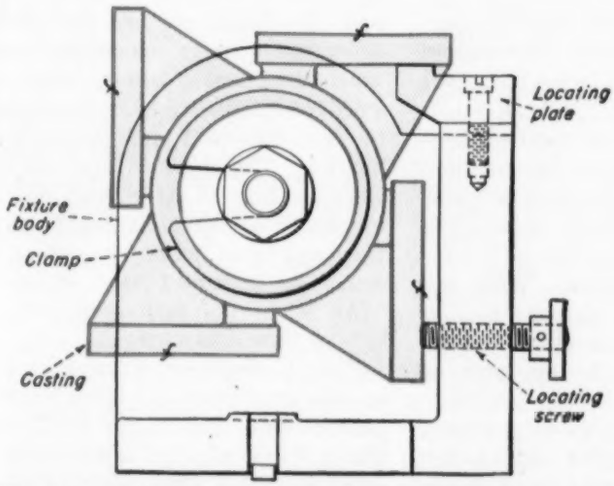


Fig. 2—Four-unit casting is bored and its hub upper face machined while held central over three beveled blocks by four upper and four lower clamping screws. Adjustment of upper screws trues hub upper face as tested by an indicator



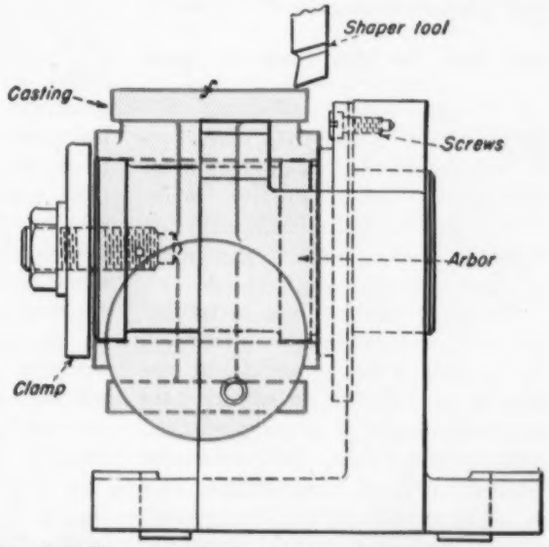
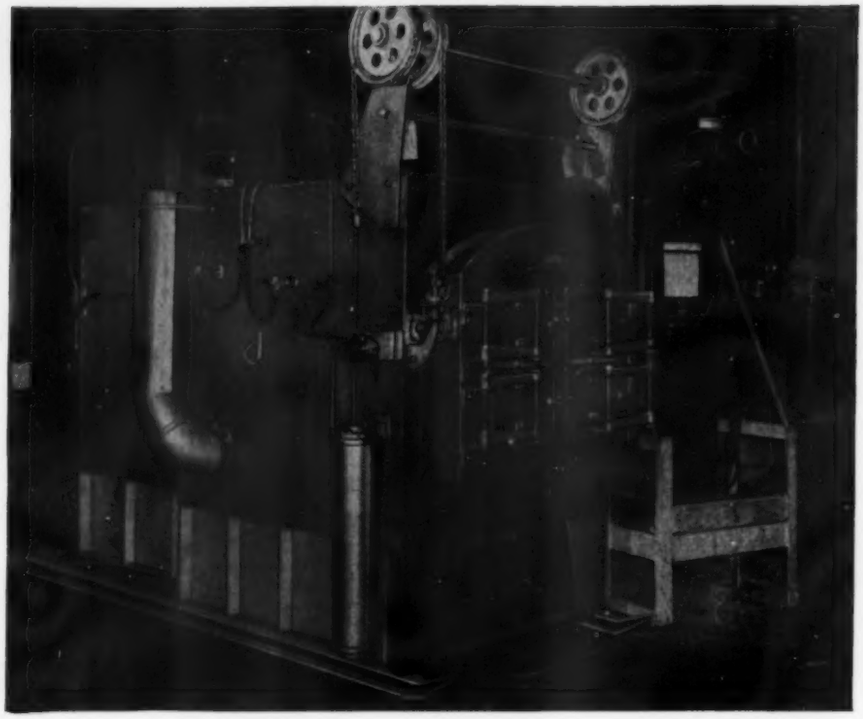


Fig. 3—Swivel-base feet are machined in a shaper with casting mounted on a fixture arbor, held by a clamping plate and positioned against a locating plate by a locating hand screw



Welded-on channel skids, cross-braced for stiffness, make this Lindberg Cyclone furnace towable by tractor. Controls (right) are mounted on a welded angle-iron rack, counterweighted to prevent tipping when it is lifted by truck. All electrical connections between panel and furnace and to power supply are equipped with plugs. Gas is supplied through a hose. Blower at top is hinged so it can be tipped down to clear low doorways

FURNACES ON SKIDS ADD FORGING FLEXIBILITY

Three units serve many hammers at Wyman-Gordon. Boat mounts for furnaces, racks for controls and plug-in connections cut moving time to less than an hour

POSTWAR FORGING runs on aluminum and magnesium at Wyman-Gordon Company, Worcester, Mass., were frequently too short to justify use of the high-production continuous furnaces.

The first solution was a circular electric pit-type Lindberg furnace. To permit it to be moved if required to the vicinity of any particular hammer or press, it was not sunk into the floor. This made use of the top door inconvenient, so a side door was cut in. A pinwheel fixture with slots to hold pieces for heating was also inserted, making a continuous furnace of the unit.

Real portability was attained, however, when the furnace was bolted on a "boat" of steel plate, so it could be tractor-towed wherever required. At the same time, controls were mounted on a separate welded rack which can be lifted and moved by "jitney" (electric lift truck). Sections of billet were welded to the rack base to counterweight it, and a steel-plate protective "awning" extended over the top. All connections between furnace and control panel were equipped with plugs. Electrical outlets were spotted as needed at operating positions. With this arrangement, the furnace can be moved to a new location and set up for operation in less than an hour.

A second furnace—this time a larger box-type Lindberg electric unit—was soon similarly equipped. This worked so well that a third one was added. The latter, largest of the three, is a gas-fired Lindberg Cyclone unit, so gas-supply plugs have also been provided at operating positions. The plate boat is in this case modified to a sled. This furnace has a removable center shelf and removable pinwheel fixture. The main door has four small doors built in for zone batching with the center shelf, and an auxiliary side door permits access to the pinwheel for continuous heating. The blower and piping were too high to clear some building doors, so the blower mounting was equipped with hinges so it could be loosened and dropped down when the furnace is moved through low doorways.

These three furnaces have handled short runs for a considerable period with maximum economy. They have also permitted more efficient use of the types and sizes of hammers available.

TALKING SHOP

Remember Maintenance

To SERVICE one series of trucks requires a dealer to purchase a thousand dollars worth of special tools. A third are "musts" (because no universal tools will do the job); the rest are recommended. Need for these tools is a direct result, in most cases, of inaccessibility in the product, of designs easy to produce and assemble but almost impossible to service. One large truck maker had to redesign his chassis before the war because big fleet operators refused to stand the high service costs. The same thing will happen again.

In this case, automotive designers can profit from the experience of machine-tool designers, who have been forced by user kicks to abandon "pretty" streamlining for accessibility, particularly in hydraulics.

Delirium

LATE IN THE WAR, DeHaviland at Toronto was unable to get Dumet wire, but could get Ducel. The authorizing officer of the British Aircraft Commission was not too busy to compose this telegram: "Delighted to decide Ducel (decorated) definitely desirable, duly diverting divers difficulties, depressing delays and differing depressions due to delay Dumet delivery dates."

Duplicated D's denote dallying.

Machineable Lizard

COCKROACHES are common enough on board ships, but strange to say, you will also find lizards, especially on sailing ships. Sometimes called "bulls eyes," these lizards are rings of lignum-vitae with a deep groove around the periphery. They are used to form an eye in a rope's end, and have a hole, or several holes, in the center through which other ropes can pass. Outlasting metal, they will not corrode or cut the rope. Rope passing through the holes is improved by lubrication from the wood.

Trucks, not the kind that run on the roads, but the round knobs at the top of a mast, are also made from "lig." They often house one or more small brass pulleys for signal halliards. As a matter of fact, it would be more practical to make the truck out of some other material and the pulleys from 'lig,' but that's the way they have always been made, and by the Great Horn Spoon, that's the way they always will.

Forging Tricks

PLENTY OF EXHAUST steam and limited compressed air at Wyman-Gordon leg to a logical solution—use of the exhaust steam instead of air for the heat-stopping jet curtain at furnace doors.

In upsetting aircraft-engine valves from bar stock, Wyman-Gordon uses the tongs as a gaging device. Tong jaws are semi-cylindrical, with appreciable shoulders. Upsetter dies are sunk with cavities to clear this cylinder. Heated bar blanks are thus positioned, in effect, in a split socket, which in turn is located as the dies close. This permits exactness in figuring stock and minimum allowances for flash. Even in steam-hammer work, men have been trained to work with grip lengths of only about 1 in., so relatively little need be allowed for grip scrap.

Preset Responsibility

TOP MANAGEMENT usually dodges responsibility for sharpened-tool resetting, so do toolroom foremen when possible. That puts it up to the line foreman to reset resharpened tools. On the new Ford crankshaft-drilling machine, three drills may work in turn on the same hole to get it to depth without slowing the cycle. Thus drill setting becomes even more important. Ford recognized this by having a toolroom man set drills to gage after resharpening. This also avoids resetting machine stops each time, to attain the exact hole depth required.

Silicones Again

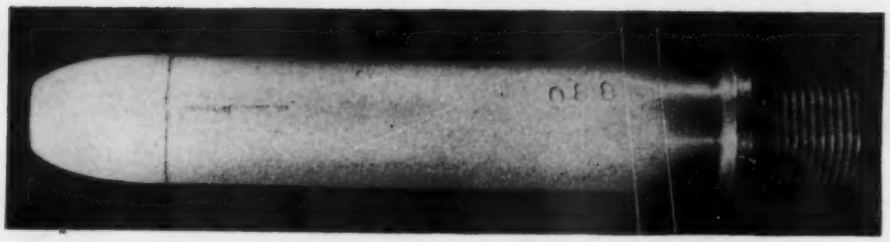
SILICONE SOLUTION makes a good lubricant for auto instruments because of uniform viscosity over a wide temperature range. A.C. Spark Plug is so using it. Another new use is for lubricating glass-making machinery where temperatures are very high. Silicone is also the friction material between flywheel and case on the new 145-hp. Ford V-8 truck engine, forming a vibration damper.

No Loss

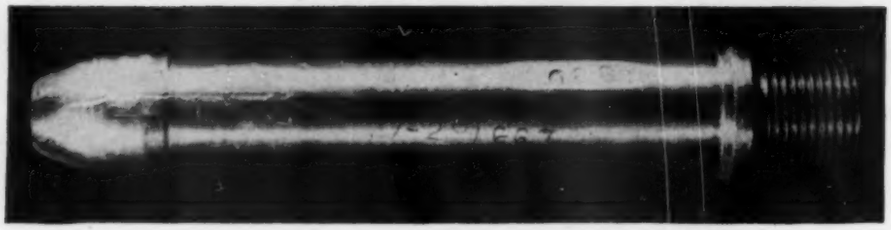
IN EXTRUDING MAGNESIUM shapes at Dow Chemical Co. there is no loss of material. One billet after another is introduced into the extrusion press. Temperature and pressure are such that the new billet fuses to the remnant of the previous one with a bond so complete that no joint can be found in the finished extrusion.

Capacity Not Plastic

INTERDEPENDENCE of industry is well illustrated by limitations in the plastic field. The chief engineer of a chemical plant explained recently that if the automotive industry were to use large quantities of molded plastics like those on the Packard rear-seat trim (Briggs Body), the tonnage would equal that of the industry at the present time. He said further that the plastic-panel "Prefab" house which Chrysler designed and wanted to build would have used twice the phenolic resins now being produced. There was not sufficient lant capacity for phenols in the country. But the real bottleneck was the coal-tar benzine or benzol used as the basis for the phenol.



Expansion mandrels, showing general scoring of the head radius and heavy localized scoring



After sandblasting in preparation for hardfacing, small scratches are completely obliterated, and deep scores thoroughly cleaned

HARD FACING IMPROVES TOOL LIFE

BY LOUIS BARRETT, PROCESS ENGINEER, GLENN L. MARTIN CO.

Application of hard-facing material by metal spray and subsequent fusion can increase performance of friction surfaces up to 14 times that of the original material

HARD facing applied to tools or machine parts exposed to severe friction and deterioration has been found by the Glenn L. Martin Co. to exceed hardened tool steels in performance. The process consists of spraying a powder form of the alloys onto a properly prepared steel surface, then fusing deposited particles together onto the base metal.

If base-metal hardness is above 30 Rockwell, it should be annealed before spraying. Spraying is done with a powder flame spray gun handling 150-mesh powder and using oxyacetylene gases. Bonding of deposited metal may be accomplished by a wide brushy acetylene flame, induction heat, or a controlled-atmosphere furnace at 1980 F. ±25°.

If tools or parts are badly scored, diameter should be reduced by rough grinding so the part, after spraying, will not be increased in diameter over acceptable limits. Whether or not the part is first ground, the next step is sandblasting, which will completely obliterate small scores. No small score must be allowed to remain, as grit may not penetrate to remove non-bonding oxides, and non-metallics may remain in such crevices.

Chromium borite crystal powder is then deposited on the part by spray gun. The gun should be adjusted to produce a clear, neutral flame, showing sharply defined inner cones. Air must be adjusted to produce a sharp, well-defined flame envelope. A distance should be maintained between flame tip and work equal to about 1/3 total luminous envelope length.

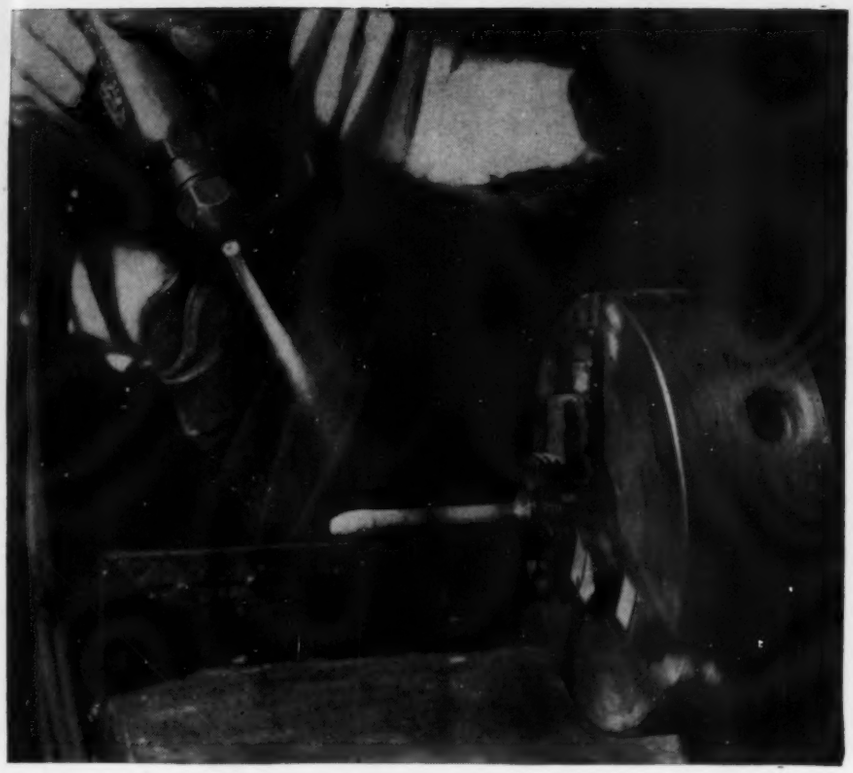
In spraying, a balance must be attained between low and high feed rates. Low feed coats work slowly but evenly and over a narrow area only, produces little waste powder, but requires more than one pass to make a dense coat. High feed rate causes a quick, highly adherent coating because of low oxide formation, but in extreme cases may lead to uneven coating (at rates of buildup greater than 0.002 in. per pass) and loss of powder economy (wide spreading powder makes it too cool in the outer flame fringe to permit adherence even if the target is hit).

Progress of buildup should be checked with a micrometer every few passes. The part should be sprayed with a coating thick enough to allow for 20% shrinkage of the layer on bonding, that is, 0.006 in. should be sprayed for every 0.005 in. desired. A range of 0.003 to 0.020 in. is required on clean-up.

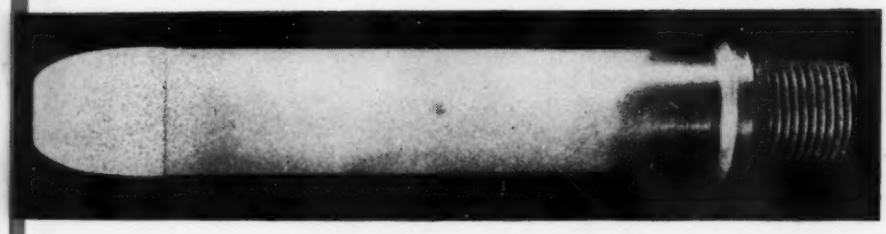
Occasionally the torch tip requires cleaning with a wire brush. There is no need to shut off the torch; the powder feed trigger is simply released during brushing.

Tinted goggles and arm rests are advantageous when applying the spray, because the operation requires close attention, and these aids will reduce fatigue and increase accuracy. On round items, a rotating device is a must.

When properly applied, the spray will completely fill all scores



Depositing hard-facing material by means of a powder-spray gun. Round parts should be rotated to obtain even deposition



Sprayed with chromium borite, mandrels exhibit a rough, gritty appearance

and irregularities. When a part such as a mandrel is sprayed, excess material on the shank can be avoided by coating with anti-spatter compound, glass tape, or protective sleeves.

Bonding may follow immediately after spraying, or the parts may be permitted to air cool. In some cases, neighboring areas may be quenched from about 1600 F.

For bonding small parts, a small torch is adjusted to a definitely neutral flame. Oxyacetylene is preferred. The smaller the tip, the better the control over bonding, but the longer it will take, and the more annealing of the surrounding metal will take place. Bonding occurs the instant the rough surface changes to a glossy one, with the flame tracing a spiral about the surface.

During bonding, the operator must observe closely the degree of fluidity created. If too hot, the deposit will run; if too cold, poor bonding will result. The operator will get the proper feel as he progresses with bonding. He will move his torch as he notices that the metal has reached the proper temperature and become fluid.

When bonding large parts, the same procedure is followed, except that the relatively large sprayweld gun is used, with powder and air feed shut off. The flame is adjusted to an oxidizing flame and held close to the work.

Small quantities in general, and small quantities of irregular parts especially, are most economically bonded by torch. Large pieces, large lots of irregular parts, or large lots of parts not suited for induction heating, may be furnace bonded at 1980 F. ±20°.

After bonding, any heat treatment of the base metal below 1700 F. may be executed. Fine hair cracks which may develop have been found to be immaterial in friction application service. On friction and impact applications, however, a cushion of stainless steel is used occasionally.

The performance of a tool-steel mandrel repaired in accordance with this process is about 8 to 14 times as good as in the original non-coated condition. The performance of a 1020-steel-coated mandrel is similar if not identical.

Bonding is performed with a torch flame or by furnace or induction heat. A glossy surface indicates that bonding is complete

Fig. 1—Annealed carbon tool steel has an identifying microstructure known as pearlite

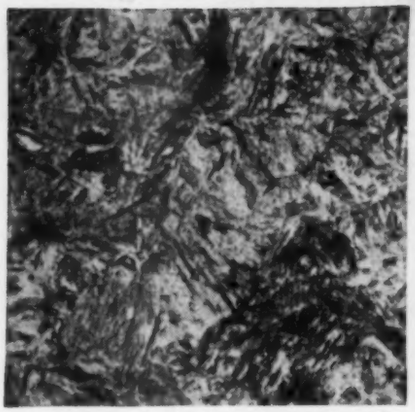


Fig. 2—If carbon tool steel is hardened and quenched, the microstructure changes to needle-like martensite

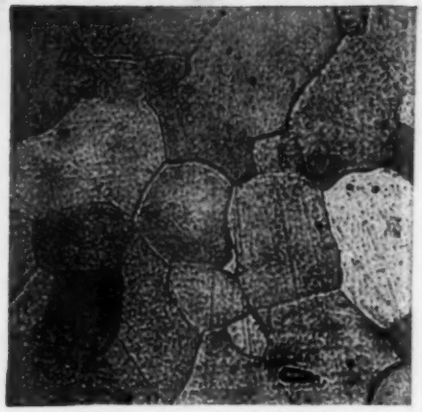


Fig. 3—Metals truly soluble in each other in any proportion lose their identity upon cooling

Heat-Treating Principles and Their Application to Salt Baths...I

This article begins a 3-part series in which a well-known metallurgist reviews the field and includes much information not published heretofore

BY HAIG SOLAKIAN,[1] SC. D.

MAN'S understanding of metals, especially the principles underlying their heat-treatment, has advanced notably during the past 25 years. Nowadays, the hardening of steel or other metals is no longer considered a mysterious process or art. The changes brought about by hardening or softening are readily understood and controlled, due to a definite pattern in the microscopic structure of the metal.

For a given hardness in steels there is a corresponding microstructure. Thus, there is a definite relationship between the internal structure of a metal and its physical and chemical properties. Slowly cooled, or annealed, carbon tool steel will have the microstructure in Fig. 1. Hardenend steel, on the other hand, will have another microstructure, Fig. 2.

A very definite and remarkable property of metals contributes to this relationship between microstructure and physical characteristics. Metals, when freezing from a molten state, are soluble to a varying degree in one another. Gold and copper, for example, are soluble in one another in any proportion. Thus, if gold and copper, in any ratio, are melted and then allowed to cool and solidify, neither the gold nor the copper can be identified under a microscope. Instead a new metal, an alloy of gold and copper, presents itself as a single structure. Such a structure, known as a "solid solution," is shown in Fig. 3.

This ability of one metal to hold another in solution varies with various metals, and for the same metals at various temperatures. Aluminum can hold about 2% copper in solid solution at 950 F., but only 0.5% at room temperature. Therefore, if an aluminum-copper alloy is heated to 950 F., held at this temperature long enough so the maximum quantity of copper (2%) is dissolved to obtain solid solution, then rapidly cooled by quenching in cold water, a supersaturated solid solution is formed at room temperature.

This treatment, heating the alloy to a temperature below fusion and then rapidly cooling, is usually called "solution" treatment. Normally, alloys so treated are relatively softer. If the same aluminum-copper alloy is cooled slowly, instead of cooling in water, only about 0.5% copper remains in solid solution; the balance of copper (1.5%) is thrown out of solution in the form of copper-aluminum compound ($CuAl_2$), which is distributed throughout the structure and readily identified.

If this same alloy, after solution treatment, is heated say to 400 F., minute particles of copper-aluminum compound are thrown out of solid solution or precipitated. This heating of such alloys at a low temperature is called "precipitat-

[1] *Formerly vice-president of the A. F. Holden Company, and now president of John Ek Industries, Inc. and Crown Chemical Corporation.*

ing" or "aging" treatment. Thus, we have solution treatment, during which alloying elements are dissolved in the body of the matrix, forming a solid solution, and also the aging treatment, during which minute particles of alloying elements or compounds are thrown out of solution and precipitated. The solution treatment results in softening, and the aging treatment in hardening of the metal. For example, duralumin, as solution treated, may have a hardness of 45 Brinell; after aging, 120 Brinell.

Another example of a material that behaves in this manner is an alloy of beryllium in copper. This alloy is solution-treated at around 1500 F., and aged at 650-675 F. After aging, the alloy develops a hardness of 450 Brinell.

So far, some non-ferrous alloys have been considered, because they offer a simple illustration of the principle. In steel, iron is alloyed with various elements such as carbon, manganese, silicon, vanadium, chromium, nickel and molybdenum. Of all these elements the most important is carbon without which it would be impossible to make steel as we know it today.

Some of these elements, such as nickel, form a solid solution with iron; others, such as chromium and molybdenum, form a compound with carbon in the steel, usually know as carbides.

These carbides, when steel is heated to a temperature above 1450 F., are dissolved in iron to form a solid solution known as "austenite." If rapidly cooled from this temperature the austenite decomposes, forming what is known as "martensite." This martensite is extremely hard and is the main constituent of all kinds of cutting tools. Formation of martensite is due to precipitation of carbides from solid solution. Thus, there is an analogy between the solution treatment and aging of duralumin and steel. Like duralumin, steel also becomes hard after aging. Fundamentally, the same principle governs these phenomena in both metals.

During solution treatment and aging of steels, a significant phenomenon occurs. There is a definite volume change when steel undergoes a change from austenite to martensite. If a piece of tool steel is heated to form an austenitic structure, this is accompanied with a decrease in volume. If the microstructure in this same steel is allowed to change from austenite into martensite by rapid cooling, an increase in volume takes place.

Volume change in steels during heating and rapid cooling, which is necessary for the hardening of tools, introduces severe stresses in the metal and creates a hazard from distortion and cracking. Take a large die, for example. It is heated say to 1600 F. and then quenched in brine. The outside cools faster and changes from austenite into martensite accompanied with an increase in volume, while the interior is slow in cooling and does not yet experience any volume change. Consequently, a definite stress is set up between the outside and the interior portion of the die. This stress sometimes is large enough to cause excessive distortion and cracking of the die.

For many years, this situation has been a source of annoyance and trouble to the heat-treater. Many an expensive die or tool carefully finished has been cracked and ruined during hardening.

TABLE I — PHYSICAL PROPERTIES PRODUCED BY AUSTEMPERING

STEEL	HIGH TEMP., F.	QUENCH TEMP., F.	HARDNESS ROCKWELL C	ELASTIC LIMIT, PSI.	ULTIMATE STRENGTH, PSI.	REDUCTION OF AREA, %	ELONGATION IN 2 IN., %
NE 9430	1550	600	38	180,000	221,500	56.0	13.5
NE 9430	1550	650	35	167,000	190,500	57.0	14.5
NE 9430	1550	700	31	144,000	173,000	59.0	15.0
SAE 1045	1550	650	27	102,000	134,000	55.0	22.0
SAE 3135	1550	650	35	156,000	194,500	58.5	17.0
SAE 4140	1550	650	37	157,000	190,500	47.5	13.0
SAE 4140	1550	700	36	152,000	181,500	51.5	13.5
SAE 4340	1550	650	40	167,500	209,000	47.5	11.5

TABLE II—*Ms* POINTS OF SAE STEELS

STEEL	AUSTENITIZING TEMPERATURE, F.	Ms POINTS, F.
SAE 4130	1600	680
SAE 4640	1575	620
SAE 1335	1600	610
SAE 4140	1550	625
SAE 5140	1575	610
SAE 3140	1575	610
SAE 6140	1575	590
SAE 2340	1550	575
SAE 4340	1550	540
SAE 1065	1575	520
SAE 52100	1550	475

TABLE III—*Ms* POINTS OF HIGH-SPEED STEELS

TYPE	C	Cr	V	W	Mo	Ms Point, F
18-4-1	0.33	3.65	1.33	18.00	——	670
18-4-1	0.51	3.70	1.12	17.80	——	510
18-4-1	0.70	3.84	1.08	17.60	——	380
18-4-1	0.84	3.90	1.07	17.70	——	275
5-4-4-1	0.38	3.90	1.43	5.40	4.00	670
5-4-4-1	0.59	3.90	1.50	5.30	4.08	425
5-4-4-1	0.81	4.00	1.40	5.36	4.02	320
5-4-4-1	0.84	4.05	1.70	5.40	4.52	305
5-4-4-1	1.00	3.92	1.52	5.35	4.08	220

TABLE IV—HOW SIZE AFFECTS HARDNESS PRODUCED BY AUSTEMPERING

STEEL	C	Mn	Cr	Ni	Mo	*MAX. DIAM. OR THICK-NESS, IN.	MAXI-MUM HARD-NESS, Rc
1. Carbon	1.00	0.40	—	—	—	0.15	58-60
2. Carbon-Mn	1.00	0.75	—	—	—	0.20	58-60
3. Carbon	0.85	0.40	—	—	—	0.15	56-58
4. Carbon-Mn	0.85	0.75	—	—	—	0.22	56-58
5. Carbon	0.65	0.75	—	—	—	0.20	54-56
6. Carbon-Mn	0.75	1.10	—	—	—	0.28	54-56
7. Carbon-Mn	0.65	1.80	—	—	—	0.625	54-56
8. Alloy	0.70	0.85	—	—	0.25	0.625	54-56
9. Alloy	1.00	0.50	0.50	—	—	0.31	58-60
10. SAE 4150	0.50	0.75	0.95	—	0.20	0.50	52
11. SAE 4365	0.65	0.65	0.65	1.75	0.35	1.00	54

*Largest diameter or thickness that will give the maximum hardness values in next column.

HEAT-TREATING PRINCIPLES continued

However, in recent years a better understanding of the underlying principles has enabled the development of methods for heat-treating metals which eliminate most of the difficulties involved. These methods are known as "austempering" and "martempering."

Austempering Avoids Distortion

This process is in direct contrast to the conventional heat-treating method, wherein steel is quenched from the hardening temperature directly into oil or water, followed by tempering at a temperature calculated to obtain the specified hardness and other desired physical properties. In austempering, the steel is heated to the hardening temperature the same as in the conventional method, but instead of quenching into oil or water, it is quenched into a medium, usually a salt bath, at a temperature above 500 F., and held at this temperature long enough to complete the stuctural transformation. It is then allowed to cool in air or water.

In the conventional method the steel, as quenched, develops a structure known as "martensite," and after tempering a structure known as "troostite." In austempering a structure known as "bainite" is developed. Steels with this structure, it is claimed, are tougher for the same hardness than those treated by the conventional method. By austempering, stress and distribution (chronic headaches in steel treating) are eliminated.

The choice of salt-bath temperature for quenching depends upon the steel's analysis, particularly the carbon content, and also upon the physical properties, such as hardness, tensile strength or impact values desired. Table I gives the physical properties obtained by austempering various steels at various temperatures. Note that a 50 F. increase in the quenching temperature reduces the hardness and tensile strength, and increases the reduction of area and elongation. Thus, by adjusting the quenching temperature, the physical properties of steels treated may be modified to suit needs.

Martempering

In this process the steel is quenched into a lower-temperature bath than in austempering. This temperature is at, or slightly above, what is known as *Ms* point. This point is the temperature at which austenite begins to change into martensite. *Ms* denotes the start of such a transformation and varies according to the analysis of the steel and the austenitizing or hardening temperature.

When a steel part is quenched into a medium operating at or above its *Ms* point, it is allowed to remain in the quenching medium until every section reaches the temperature of the medium. The holding time in the quenching medium is approximately five minutes per inch of cross section. Then the steel is removed from the quenching medium and cooled in air to room temperature.

During the cooling period austenite transforms to martensite, causing the hardening of the piece. Since such a transformation is associated with a certain degree of volume change and resultant stress concentration, the steel after reaching room temperature is tempered to relieve the stress and to obtain any hardness desired. This process permits heat-treating of intricate tools and dies without excessive distortion or cracking. Some of the commonly used steels and their *Ms* points are given in Table II.

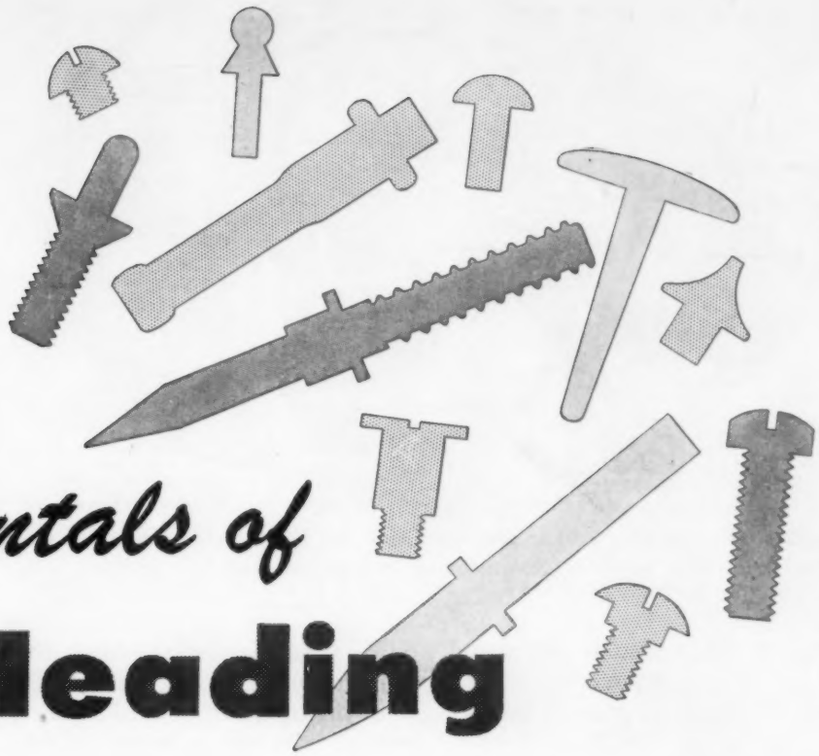
For example, if a part made of SAE 52100 steel is heated to 1575 F., quenched into a salt bath at 500 F. and air cooled, the hardness developed is Rockwell 64-65C. Temper the same piece at 350 F. for 30 min., and a Rockwell hardness of 61-62C is obtained.

Similarly, *Ms* points are given for different types of high-speed steels, Table III.

There is a limitation as to the size of a piece and the corresponding hardness obtainable by martempering. This is illustrated by Table IV.

In designing a part to meet a certain hardness specification, the dimensions of the part and the type of steel able to give the desired hardness for the particular diameter or thickness should be carefully considered. For example, an engine part with a diameter of ½ in. is required to have a hardness of Rockwell 50—52C. From the above list any one of the steels numbered 7, 8, 10 and 11 would meet the specification. It is highly desirable and important to have such information before deciding upon the steel for any critical part.

Part II of the series will be published in an early number.



Fundamentals of Cold Heading

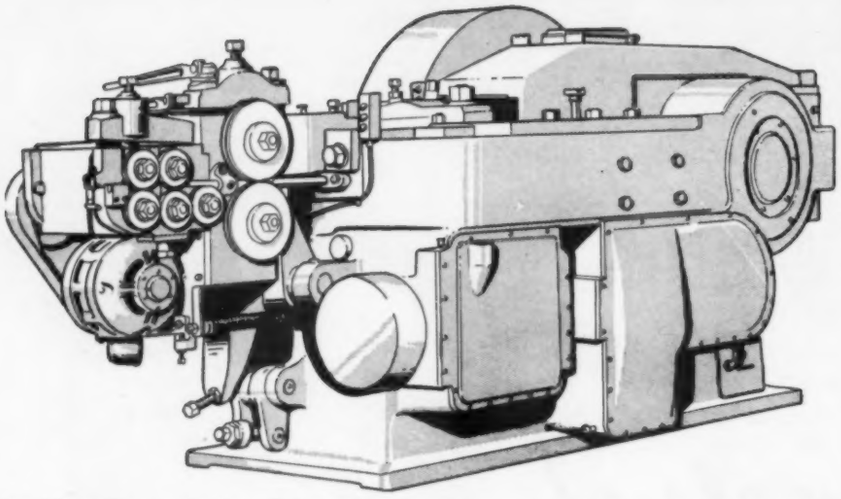
BY H. E. LINSLEY, Associate Editor, American Machinist

When prehistoric man first pounded the end of a bronze chisel and found that it tended to mushroom, he discovered, albeit unwittingly, the fundamental principle of cold heading. It was not until the nineteenth century, however, that the process was brought under control, and cold-headed products became a commercial possibility.

Although there are only two manufacturers producing cold-heading machines in the United States, there are many such machines in operation, producing an almost limitless variety of products. There is nothing mysterious or magical about the process, although a considerable amount of know-how is involved in obtaining maximum quality and output at minimum cost, but it has long been shrouded in an aura of secrecy on the part of, at least, most users.

Curiously enough, there are no books dealing with the subject, and only an extremely small amount of other literature available. To shed some light on the matter, American Machinist has compiled this comprehensive report.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES



Double-stroke, solid-die cold header manufactured by National Machinery Co., Tiffin, Ohio. This is the largest machine in this line ,and will produce ¾-in. dia. parts at 55 per min.

PLASTIC deformation of metal wire or rod without the use of heat has found its greatest field of application in the formation of buttons or heads, as in the manufacture of screws, bolts and rivets. Consequently, the process has come to be known as cold heading, and although somewhat of a misnomer, since upsets can be made equally as well in the center as at the end, the term is almost universally accepted. The process is sometimes performed in a standard punch press, but the individual handling of precut blanks is slow and reduces the rate of production.

For this reason, there has been developed a line of special machines known as cold headers. These are, in effect, horizontal presses arranged for continuous, fast operation, with automatic feed and cutoff. The simplest form, called the spoke or rod header, is designed for forming the head on bicycle spokes, exceptionally long rivets, transom rods and similar parts, and requires the feeding of individual blanks. This may be done manually or from a magazine, and either one or two strokes may be employed.

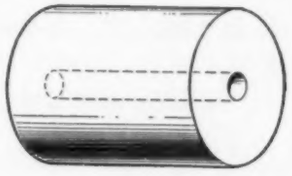
Standard machines are designated as single, double, triple, or multiple stroke, and as either solid-die or open-die types. The single-stroke machine requires one revolution of the flywheel to produce a part, the double-stroke requires two revolutions, and the triple-stroke three revolutions. The multiple-blow header is a special type which makes a part at each revolution but requires several consecutive stations to perform the work.

Machines may be driven directly from their own motors, or by belt from a countershaft, and either a crankshaft or an eccentric may be used to obtain the straight line motion of the gate. Some of the smaller, short-stroke machines make use of a toggle mechanism, and possess the particular advantage of having the toggles operate alternately above and below the center, thus producing two blows for each revolution of the flywheel and giving double the output of a conventional machine.

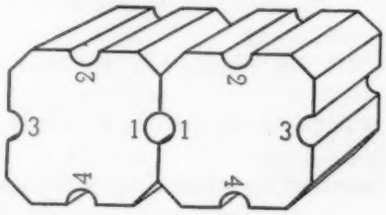
The type of header to be used for a particular job depends on the amount of material needed to form the upset, the length of the shank, and the location and shape of the head. In general practice it is not advisable to form a head with a diameter in excess of 2¼ times the diameter of the stock on a single-blow header, but there is no hard and fast rule governing this. Experience is the best guide, but the formula given in the accompanying illustration will be found useful in selecting the proper type of header. In a solid-die header, S should not exceed 8-10D for normal speeds, and may be as short as desired. Special lengths up to 12D are possible, but for lengths over 8D the speed of the machine must be reduced 20% to avoid too much difficulty in clearing the work from the dies.

In an open-die header, the length S should not be less than 4D, or a reasonable thickness of die to withstand the heading pressure.

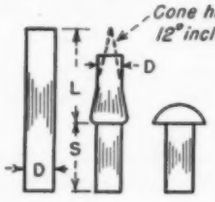
Other factors being equal, solid



Solid dies are simple cylinders of hardened tool steel with a hole for the shank of the workpiece



Open dies are made from two rectangular blocks with semicircular grooves on each of four sides



D — dia. of wire to be upset

S — length of shanks

L — length of wire to form head

Single Stroke
L — 2¼ D

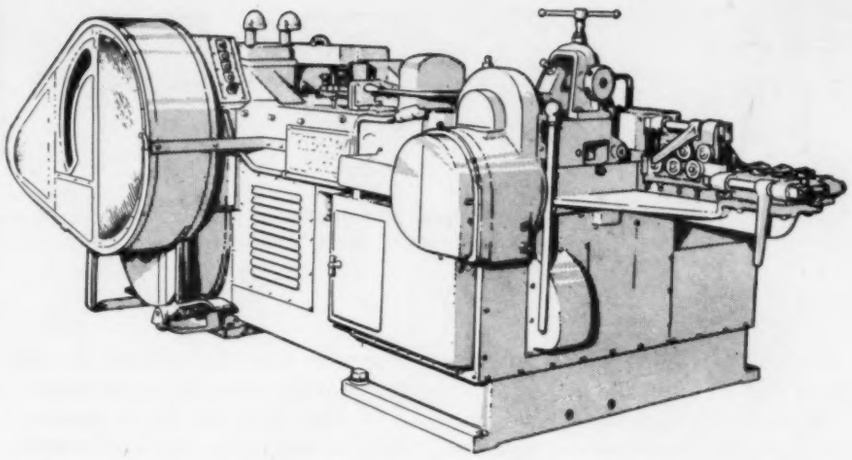
Double Stroke
L — 4½ D

Triple Stroke
L — 6 to 8 D

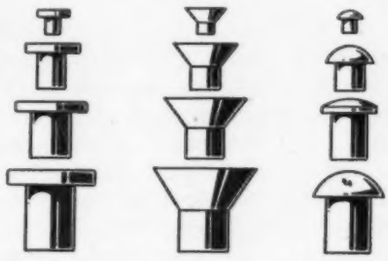
Selection of the proper type of header can be made by using these formulas for all ordinary materials. Experience, however, is the better guide

dies are generally preferred, as their use eliminates the possibility of producing a flash under the head or down the shank. However, if the diameter of the shank is less than 1/16 in., trouble may be experienced because of lack of rigidity in the knock-out pin, and special precautions may have to be taken.

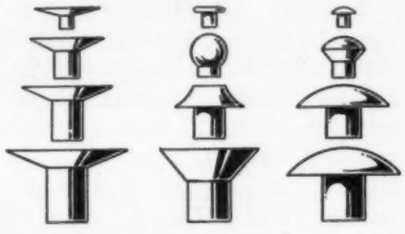
Solid dies are merely short steel cylinders with a hole through the center. Open dies are made from two rectangular blocks of steel with a half hole on each of the four sides. This gives four sets of working dies from each pair of blocks. With solid dies, if protracted runs are contemplated, inserts of cemented carbide can be used to give vastly increased die life. Moreover, in some machines, the same solid and open die can be used for a variety of lengths of parts, provided no pointing or extrusion is to be done.



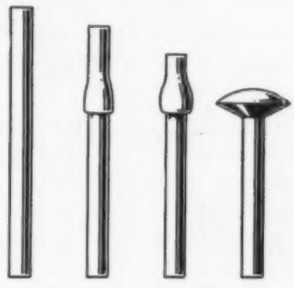
Latest type of Hipro Header manufactured by Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn. A solid die, double-stroke machine, it will handle stock up to ⅜ in.



Single-stroke machines are adequate when head diameters or volume are relatively small, and the material lends itself easily to upsetting

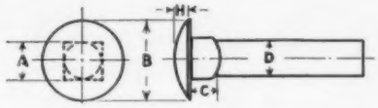


Double-stroke headers are necessary when the diameter of the head is more than 2¼ shank diameters, or the volume of metal is greater than can be upset in a single blow



Triple-stroke machines are required to produce large heads of this type, in which a considerable quantity of stock must be gathered. Steps involved are; cutoff, first coning, second coning, finish form

TABLE I—ALLOWABLE HEAD DIAMETERS IN RELATION TO WIRE DIAMETERS



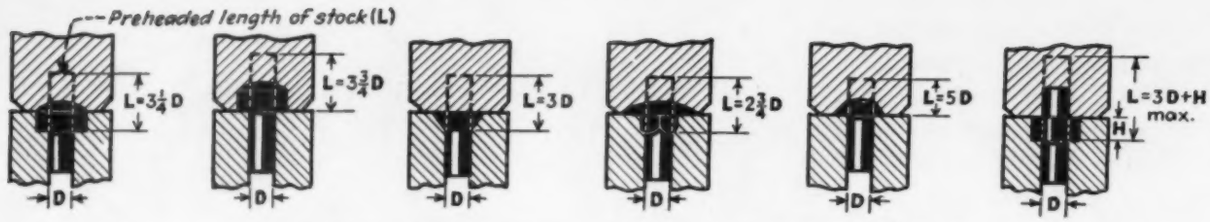
D NOMINAL DIAM.	B DIAM. OF HEAD IN.	H THICKNESS OF HEAD IN.	A WIDTH OF SQUARE IN.	C DEPTH OF SQUARE IN.	PRESSURE REQUIRED IN TONS TO UPSET
3/16	0.530	0.120	0.205	0.125	40
1/4	0.610	0.142	0.260	0.125	50
5/16	0.730	0.168	0.320	0.187	65
3/8	0.844	0.194	0.382	0.187	100
7/16	0.970	0.220	0.450	0.250	115
1/2	1.094	0.250	0.510	0.250	125
5/8	1.343	0.343	0.630	0.250	200
3/4	1.593	0.375	0.735	0.250	300

Header Capacity

While the capacity of a header is usually designated by the diameter of the wire to be used, this rating also refers to power required for such standard articles as cap and machine screws with head sizes according to American National standards. Whitworth heads, for example, may require a larger header because of the greater amount of material to be upset. The volume, and particularly the area, of the upset really define the tonnage required, and from this the proper size machine should be selected.

A thin head of considerable area requires much more pressure than a thick head of comparatively smaller diameter where the volume of metal is alike in both upsets.

Table 1 shows approximately the allowable diameters of heads in relation to diameter of wire. The pressures were determined from hydraulic press tests, and are based on those required for carriage bolts



Size and shape of the head, as shown here, place definite limitations on the amount of stock that can be upset in a double-blow header

which necessitate more tonnage than cap screws.

It must be understood that on a single-blow machine there is no control of the flow of metal, and that the amount of upset is strictly limited. Attempting to upset too much material in a single blow will produce lopsided heads, or the material will split, or buckle and cause cold shuts.

On double-stroke machines the amount of upset is governed to a large extent by the shape of the head, and it is not always possible to attain the 4½ diameters mentioned above.

Triple-stroke machines are used to only a limited extent, when the amount of stock to be gathered is greater than can be handled in two strokes. Unless the metal is particularly ductile, however, an annealing operation is usually required between the second and third upsets. In this case the work is best performed in a two-stroke machine to partly form the head, and completed in a single- or double-stroke reheader equipped with an automatic feed.

On particularly tough material it is frequently necessary to use a larger machine than would otherwise be indicated. To determine the tonnage in such cases it is necessary to calculate the diameter of the head in sq. in. and multiply by 150. This will give the tonnage necessary to upset the head, and a machine should be selected capable of exerting this tonnage as a minimum for the job.

Heading Wire

Wire stock for cold heading must be ordered specifically for the purpose, and must be free from all surface imperfections, since the action of cold heading will cause even very minor flaws to open up into wide cracks. It should be protected from corrosion, as rust flakes may score the dies and punches. A light film of oil tends to increase die life, and is usually applied by wrapping a twist of oily waste around the stock at the entrance to the feed rolls. This also serves to wipe off any foreign matter. Stainless steel for cold heading is supplied with a light coating of soap and lime which acts as an adequate lubricant. Soap-dipped wire is also recommended for particularly difficult heading operations in other materials. Kerosene is sometimes used as a lubricant, but it is not recommended as its use tends to shorten the life of the tools.

In a few special cases a flow of oil may be supplied to the dies. However, if large quantities of oil are used, some may be trapped between the work and the punch and will prevent the head from filling the cavity. No. 2 cup grease is frequently recommended as a lubricant, and a thin film will suffice to protect the tools from wear and prevent sticking in the dies.

Two blows on a double-stroke machine, followed by two separate passes through a single-stroke reheader ,with an anneal before the final blow, were necessary to produce these special head rivets. Triple-stroke machine could be used if available

Open hearth, bright drawn, basic steel wire gives the best results. Wire that has not been drawn but which is thoroughly pickled is sometimes used for open-die work, but the usual large tolerance required by the mills is not good enough for most work. The tolerance must be brought down to ±0.004 in., and even then can be used only for certain types of work. It is not at all suitable for solid-die work. The usual tolerance for drawing wire is ±0.002 in Closer tolerances necessitate an extra charge.

Very little wire is now used under 0.10 carbon, although some is still made 0.08. Capscrews and similar products are seldom made with less than 0.15, and more often with 0.20 carbon.

A good average low carbon heading wire would be:

Carbon	0.14 to 0.20
Manganese	0.30 to 0.45
Silicon	0.10 appr.
Phosphorus	0.04 max.
Sulphur	0.04 max.

Type E high carbon wire should average:

Carbon	0.27 to 0.37
Manganese	0.79 to 0.90
Silicon	0.10 appr.
Phosphorus	0.04 max.
Sulphur	0.04 max.

Screws made from this latter steel require heat treatment after manufacture, and in fact, it is common to heat-treat all capscrews above 0.20 carbon. For the lower carbon ranges, heat treatment may or may

not be performed, as desired.

Steels up to 0.40 carbon can be headed successfully, and chromium steel can be worked if the wire is thoroughly annealed. In making steel balls, for example, carbon runs as high as 1.10, and chromium 1.80, and in the very soft annealed state the steel will work readily. An alloy of 1½% nickel will work well in the annealed state, but while 3½% nickel can be upset cold, it is very difficult to work and very hard on the tools.

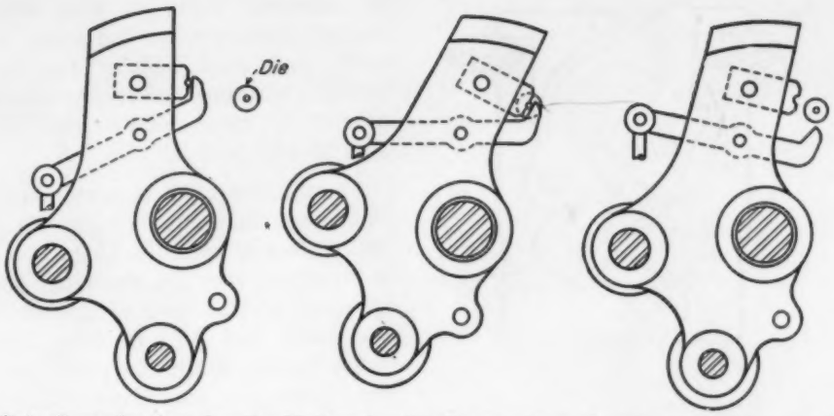
Bessemer wire or free cutting screw stock is not suitable for heading, as the large sulphur content tends to cause splitting. Occasionally, when there is only a small upset, and subsequent machining operations must be performed, a low sulphur Bessemer wire may be used, but as a general rule it should not be considered.

If the stock is to be extruded it should contain not less than 0.15 carbon, and should be furnished with a lubricant coating. American Steel & Wire Co. No. 2 finish is an acceptable grade for this purpose. Indeed, many bolt makers use this particular finish for all work, as, particularly with solid dies, it prevents die scoring.

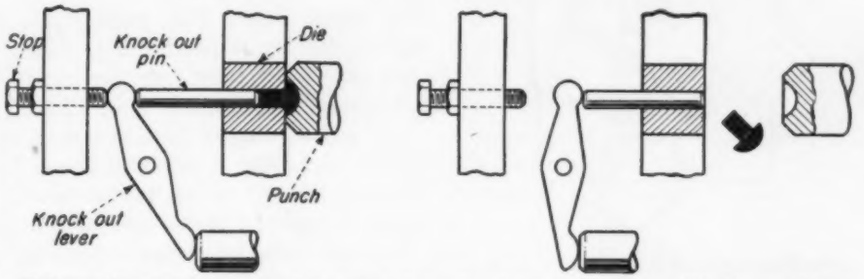
Almost any material can be successfully cold headed, provided proper care is exercised in die design. Aluminum is commonly used in the commercially pure form 2S and 3S, but where greater strength is needed 17S, A-17S, 24S and 53S can all be used. Brass is one of the most commonly headed materials, the most popular types being yellow screw brass (63% copper), and cartridge brass (70% copper). Beryllium copper and phosphor bronze, silicon bronzes, nickel silver, Monel, lead, zinc, silver and gold are among other materials successfully cold headed.

Wire Sizes

For straight heading operations, the wire size should be about 0.002 in. under the required finished diameter of the shank, as there is always a certain amount of upset in the shank before the head starts to form. This amount of undersize will be taken care of at the mill if stock is ordered to the nominal diameter and specified to be for cold heading.



Cut-off mechanism for the National solid die machine, showing the pickup and release mechanism of the gripper finger. Left, start of stroke; center, end of stroke, showing work held in line with die; right, return stroke, showing how gripper drops to clear approaching punch



Schematic arrangement of knock-out mechanism as used on solid-die machines. The stroke and timing are adjustable by means of the operating cams

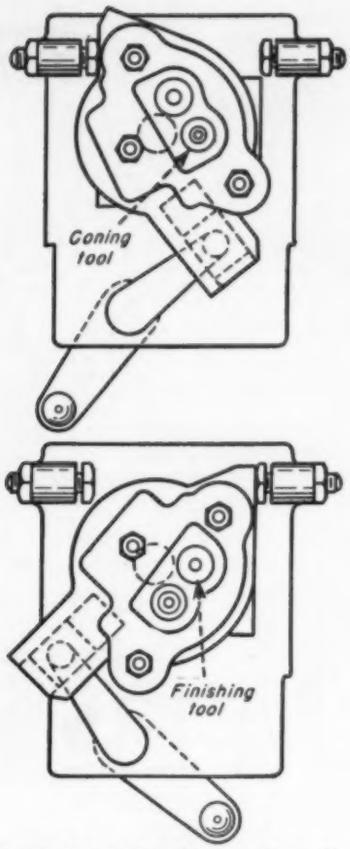
The best method of selecting the proper size of wire for a given blank is as follows: Assuming a ⅜-in. capscrew, the nominal O.D. is 0.375 in. The tolerance for O.D. for a Class 2 fit is 0.375 to 0.362. However, this range is seldom used. Most manufacturers begin with a size 0.005 in. under the maximum O.D., or in this case 0.370 in., as a minimum limit for the finished blank diameter, and allow the die to wear to the maximum, or 0.375 in. In this case the maximum wire size should be 0.00 in. under the minimum blank size, and the minimum wire size should be 0.006 in. under the minimum blank size. Then for a minimum blank diameter of 0.370 in. the wire should be 0.366 ±0.002 in. This rule will work for any Class 2 fit; for a closer fit, the tolerance should be held somewhat closer.

If the blank is to be extruded for thread rolling, begin with 0.006 in. under minimum pitch diameter, and use that figure plus or minus 0.002 in. as the wire size.

Wire diameters must never be confused with blank or shank diameters; there is a tolerance to be allowed for.

Single-Stroke Headers

On a single-stroke, solid-die machine the wire stock is passed through automatic feed rolls and into a cutoff die. At the start of the stroke the wire feeds forward until it comes against a positive stop adjusted to the required length of blank. A shear blade then slides across the face of the die and cuts off the projecting piece of stock. The blade has a semicircular notch in its cutting edge into which the blank is held by springs or a hinged finger. As the stroke continues, the blade carries the blank forward until it is directly in line with the heading die, and holds it in that position until the punch forces it into the die. The finger or springs then release, and the cutoff slide withdraws. The punch pushes the blank back into the die until its movement is arrested by the knock-out pin;



Oscillating tool holder used on National machines. Coning tool is shown in operating position with actuating lever swung to right (Top.). When lever swings to left (Bottom), finishing tool turns into working position.

whereupon the outer end of the blank is compressed, and forced to conform to the shape of the cavity in the punch head or the end of the die. When the punch withdraws on the return stroke, the knock-out pin slides forward and pushes the finished part out of the die.

With this arrangement it is obvious that parts having the same diameter head and shank, but different lengths, can be made with the same set of tools by merely adjusting the position of the stock stop and the knock-out pin within the limits of the machine.

At the start of the stroke the entire pressure exerted by the punch must be absorbed by the knock-out pin, but the moment the stock begins to upset, the thrust is taken largely by the newly formed shoulder against the face of the die, and pressure on the pin is reduced. There is thus only limited tendency for the shank to swell and bind in the die, but neither is there much possibility of squaring up the end by pressure against the pin.

For this reason it is particularly important that cutoff be as clean and square as possible. If the stock is dragged over in shearing, the unequal distribution of metal at the head end will produce lop-sided heads, while the shank end may require a secondary pointing operation to produce a part of acceptable appearance.

In one open-die type machine, the stock feeds through a cutoff die and between the two halves of the header die until it reaches the stock stop. The header die opens slightly to permit free passage of the stock. A powerful clamping mechanism then closes the header die to grip the stock, and at the same time slides the die over to the center of the machine, shearing off the blank and holding it in line with the advancing punch. Thrust of the punch is resisted partly by the gripping action of the dies and partly by a back-up plate over which the die slides. On the return stroke the die carries the finished part back to the feed position where it is automatically opened so the incoming stock can eject the part.

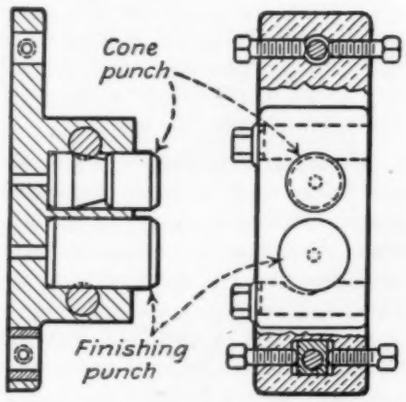
The travel of the die is only slightly greater than the diameter of the stock, and as these machines usually operate at high speed, the stock stop can be timed to strike the headed part as it leaves the die and kick it clear of the advancing punch.

As the back face of the die is used as a shear, it is apparent that each different length of part will require its own set of dies, and while this may not be important in very long runs, it can add appreciably to the cost of short runs. There is, moreover, considerable danger of chipping the rear edge of the die and thus ruining it long before its normal working life is expended.

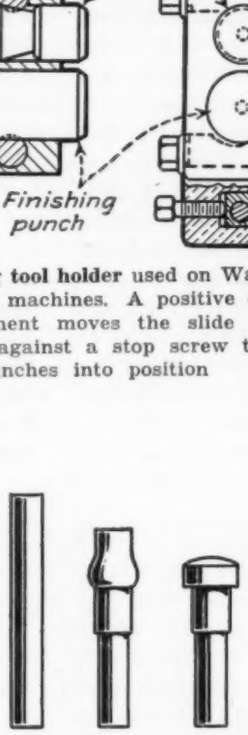
One new type of machine is of the universal type, and is designed to employ either open or solid dies. Its operating principle is the same as a standard solid-die machine in that the stock is cut off, carried forward, and pushed into the die. At the time of heading, the open type dies are held rigidly together, but before knockout starts, the dies open slightly to relieve the grip. This system overcomes one of the objections to open dies by making it possible to use one set of tools for several parts of different lengths. If desired, the dies may be clamped solid and the machine used as a solid-die type on very long work, as long as no trouble is experienced with ejection. By means of a simple adapter, standard round solid dies can also be used.

Multiple-Stroke Headers

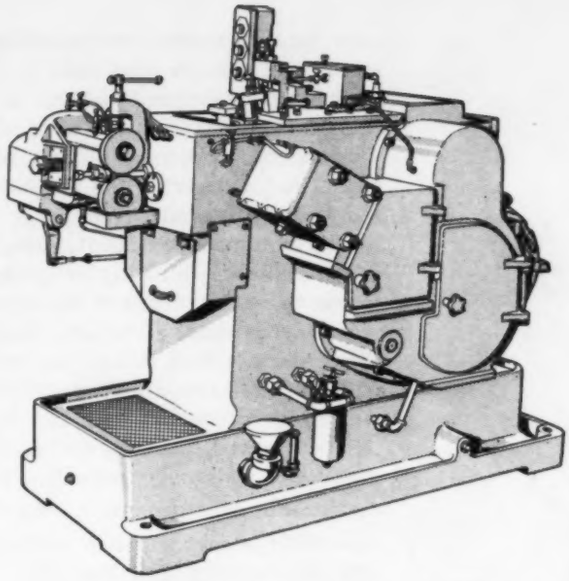
In operation, double- and triple-stroke machines of the solid, open, and universal types are identical with their single-stroke counterparts, except that on completion of the first stroke the feed and ejector mechanism remains inoperative,



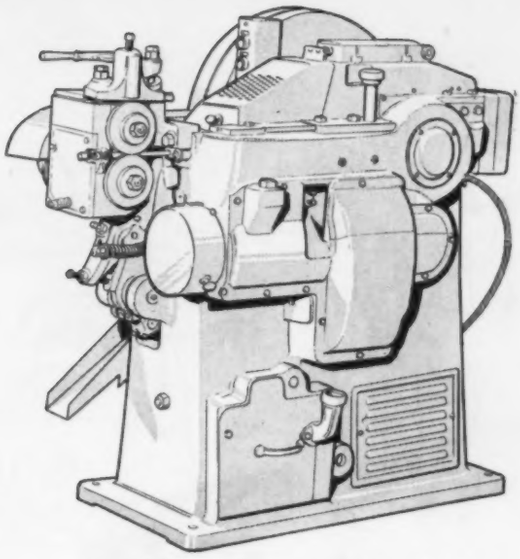
Sliding tool holder used on Waterbury Farrel machines. A positive cam arrangement moves the slide up and down against a stop screw to bring the punches into position



Fillister head screw blank with shank reduced by extrusion in preparation for thread rolling which brings the thread O.D. up to normal shank diameter



Waterbury-Farell solid die, double-stroke Hipro header for 3/16-in. stock



National single-stroke, solid die header designed for ⅛-in. stock

and a second punch is presented to the work with the next stroke of the machine. On triple-stroke machines, this is followed by a third punch before the work cycle repeats.

The method of indexing the punches varies with the different machine builders. On one type the punch holder moves upward a fixed distance with each successive stroke, and is locked in position. At the end of the cycle it returns automatically to the starting position. On another type the punch holder moves horizontally instead of vertically, and on another the punch holder is caused to oscillate through an arc, with positive stops used to insure exact alignment.

For special purposes, additional attachments may be added to standard machines. For making tubular rivets, for example, in which the hole depth does not exceed about one diameter, a transfer arm may be used to take the part from the heading die and place it in a second die during the back stroke of the machine. An auxiliary punch then forms the hole at the same time that another part is being headed.

In addition to heading, it is possible to perform a certain amount of extrusion. On bolts that are to be roll threaded, for instance, it is necessary that the portion to be threaded be smaller in diameter than the shank. The stock used is the diameter of the shank, and the die is necked down at the desired place. As the blank is pressed into the die by the first punch, the advancing end is forced into the smaller diameter. This, of course, lengthens the blank a certain amount, and provision must be made for this in adjusting the stock stop.

The amount of extrusion that can be performed is limited to a reduction in the area of the blank not exceeding 30% of the original blank end area. In cases where there is too great a differential between the two diameters, or where a square shoulder is required at the diameter change, the stock must be headed up from the smaller size. Here again, much depends on the character of the metal, and experience will dictate which plan is to be followed. Extrusion can be done only in solid dies.

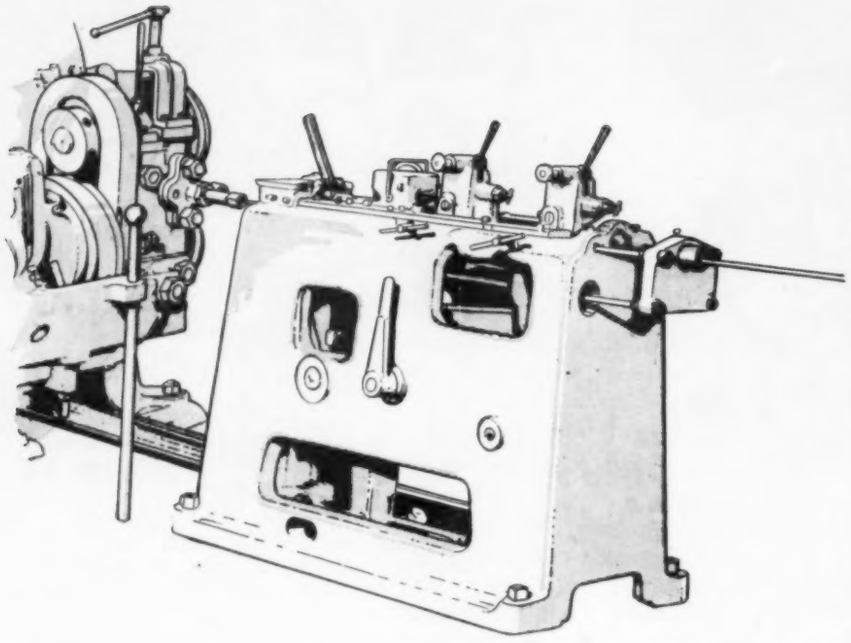
Special-Purpose Headers

For the production of steel balls, standard headers could be used, but where the quantities are large, as in ball bearing plants, special ball headers are used. These are of the solid-die single-stroke type, and differ from conventional machines only in being equipped with a knock-out mechanism on both the die and the punch. This is necessary to prevent the ball from sticking in the hemispherical cavity in the punch. Production on these machines varies from 70 per min. on 15/16 in. dia. balls, to 200 per min. for 3/16-in. dia. balls.

Another variation of the standard header is the progressive header, a machine having several stages in which a number of operations are carried on simultaneously, the parts being trasferred between the stages by transfer fingers or similar mechanism. A finished part is thus produced with every stroke of the machine. This type is particularly suited for jobs requiring a large amount of gather where the double-stroke machine cannot be used.

A development from this type of machine is the special nut forming machine for the production of single or double-chamfered nuts; single - chamfered, washer - faced nuts; and other standard and special nuts from round stock. All the operations required to form a nut blank are performed in one stroke.

The dies are arranged horizontally across the gate, and as a piece of stock is cut off it is moved across to the first die where it is squared up. Simultaneously, the blanks in the other dies advance one stage, so one finished part is produced at each stroke. In making a double-chamfered nut, for example, the second die forms a



Cold drawing the stock in this Ajax-Hogue wire drawer immediately before heading, permits making cold drawn products from hot rolled stock, improves quality and reduces costs

dome or cone shape on each end of the blank, increases the diameter and reduces the height. The third die produces the hexagonal shape with a chamfer on both sides, and forms two central recesses. These recesses, through which the hole is next pierced, form the countersinks for the hole. The final operation is to punch out the slug from the center, whereupon the nut blank falls into a delivery tube leading to a tote box, and the slug into another tube leading to a scrap box.

Parts are moved from station to station by spring transfer fingers which are removable as a unit to suit different size nuts.

Special dies are sometimes required for these machines. In the case of a double-chamfered hexagon nut, the second forming die, which has a hexagonal opening, is held under spring tension. This is known as a floating die, because as soon as sufficient pressure has been applied to the dome-shaped blank by the punch, it will cause the metal to flow, and the die will shift or float to form an equal chamfer on each side of the nut.

At the piercing station, nuts having relatively small holes compared to the distance across flats, are supported on the face of the die while the hole is pierced, but on nuts having comparatively large holes, like the SAE. standard, the blank is confined in a special die to prevent bulging at the sides or other distortion. This die opens to release the nut when the punch recedes.

Equipment of this kind is not used for nuts smaller than ¼ in. These are stamped from strip metal in a multiple punch press, and then chamfered and resheared in a special machine.

Nuts produced by cold heading are strong, accurate and well finished, and their cost is extremely low, since the only scrap involved is the slug punched from the center to produce the hole.

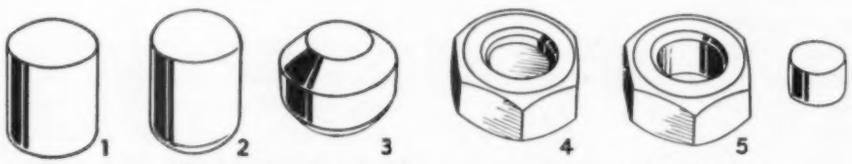
Header Accessories

Production of accurate, cold headed, cold drawn parts from hot rolled stock can be achieved by the use of a special wire drawing machine located directly in front of the header and operated by the header crankshaft. The stock is fed intermittently into the header by the regular feed rolls in the usual way. Between feeds it is held by grippers on the wire drawing machine adjacent to the feed rolls, and a drawing die is pushed back along the rod a distance equal to the amount fed. Simultaneously, a straightener bushing is pushed along the rod in front of the drawer to eliminate all sharp kinks. When header feed occurs, the grips release, and the drawing die and slide move forward with the wire to be pushed back again during the next stationary period.

Carbide dies are used, and the die slide incorporates a chamber for lubricating the rod with a drawing compound consisting of aluminum stearate and slaked lime, or aluminum palmitate, slaked lime and calcium carbonate. This coating remains on the wire and acts as a lubricant for heading.

Wire headed only a few seconds after drawing has a considerably lower yield point, so heading is much easier, and lower pressures are exerted on the heading dies. The metal flows more easily, filling out the impressions better, and resulting in longer die life. The hot rolled stock is appreciably lower in cost than cold drawn, and complete uniformity from coil to coil is assured by drawing through the same die.

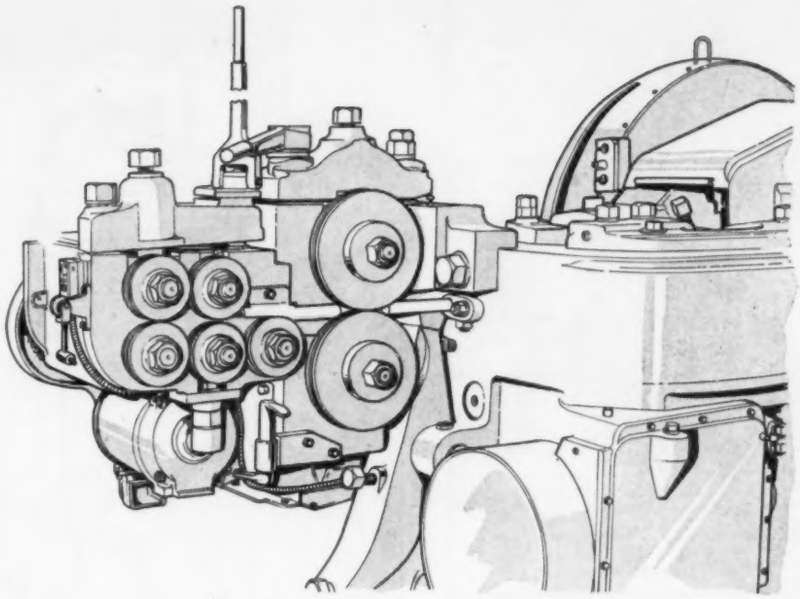
An attachment particularly desirable with wire sizes of ⅝ in. or over, is a power-driven wire feeder and straightener. This is attached to the header in front of the regular feed rolls. An arm located just ahead of the first pair of auxiliary rolls rests on the wire stock, and when the end of a coil is reached this arm drops and automatically stops the large main feeder rolls. The end of the next coil is then inserted between the first auxiliary rolls and gripped by a hand operated lever. These rolls are powered by a stallable type



Double chamfered hexagon nuts are produced in five steps performed simultaneously on a special nut forming machine

motor, under push button control, which feeds the incoming wire forward until it contacts the end of the previous coil; then the motor stalls until the main feed rolls are restarted, enabling the auxiliary rolls to follow up so that the ends of both coils remain in contact as they pass into the header. The three other rolls on the feeder act as straighteners and remove any kinks in the stock. The feed motor is reversible and can be used to remove stock from the header if necessary.

Plain roller straightening attachments can also be applied to heading machines when exceptionally straight shanks are important. Relieving attachments are also available for insuring sharp corners on the squares of carriage bolts and similar parts. These permit the knock-out pin to recede a predetermined amount after the coning blow, thus allowing the partly upset blank to slip back into the die as the finishing tool completes the bolt. Various special attachments may be used for special jobs, but these are built specifically for the work in hand.



Feeding a new coil of wire, particularly in the larger diameters, is simplified by the use of a power-operated feeder and straightening attachment

Die Design

Cold-header dies are relatively simple in design, and in the case of solid dies consist of a cylinder in which a hole of the desired size is bored and ground concentric with the O.D. Extreme accuracy is essential, particularly as regards straightness and concentricity, and final sizing is usually done by lapping.

Hardness is a critical factor, and the utmost care must be taken in heat treatment. A hard working surface is required, supported by a tough body. The case must be deep enough to prevent sinking and tough enough to withstand chipping or spalling. It must be able to withstand severe impact and abrasion, and have shallow hardening characteristics. The body must be tough enough to prevent splitting under the heavy internal pressures.

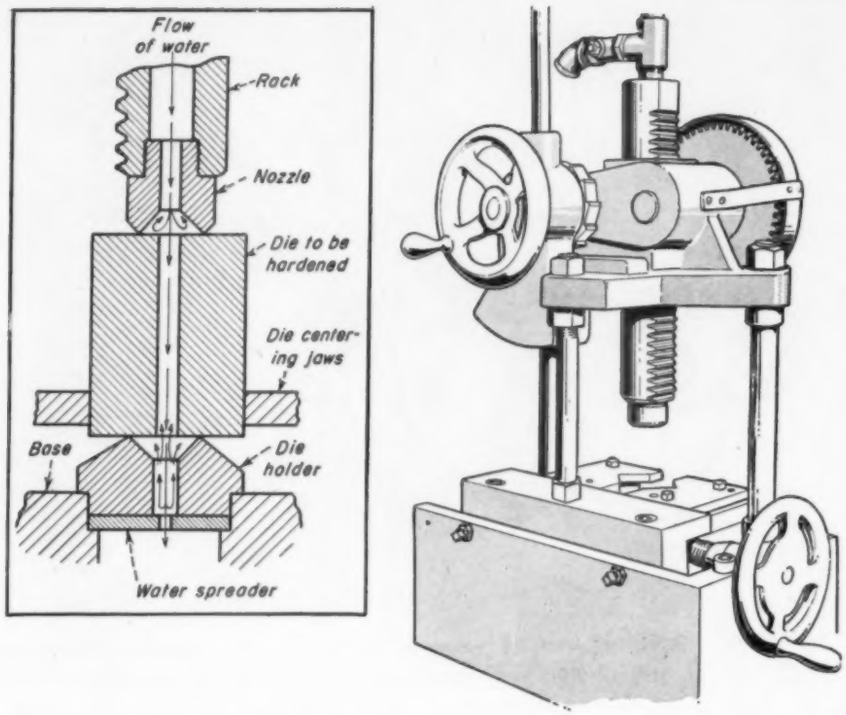
Ordinary tool steels are not suitable for header dies, and most steel companies manufacture a special steel for the purpose, with a controllable depth of hardening.

Table II lists a number of such steels particularly recommended for cold-header dies, but there are many others available, and their selection is largely a matter of personal preference on the part of the user. Temperatures given are only approximate, and will necessarily vary somewhat for different applications. Detailed information can be obtained from the manufacturers.

Solid dies are turned from round bar stock, and the required hole bored slightly undersize. After hardening, the hole is finished to size, preferably by grinding, although in some cases the temper is drawn enough that a hard reamer

TABLE II—RECOMMENDED STEELS FOR PUNCHES AND DIES

NAME	MANUFACTURER	ANALYSIS					HEAT TREAT		
		C.	Mn.	Si.	Cr.	V.	HARDEN AT	DRAW	ROCKWELL
La Belle Extra	Crucible Steel Co.	0.95	0.25	0.20			1500-1550	450-500	61-57
Carbon Cold Header	Latrobe Electric Steel Co.	0.93	0.26	0.20	0.05	0.20	1450-1650	300-600	65-56
Yellow Label	Wm. Jessop & Sons	0.95	0.25	0.25			1450	450	58
H 9 Extra	Carpenter Steel Co.	0.90	0.40	0.40			1525-1575	400	60-63
New Process	Jessop Steel Co.	0.91-0.98 or 0.95-1.05	0.25	0.18			1430-1500	425-550	
XX Tool Steel	Bethlehem Steel Co.	0.90-1.00	0.30	0.20			1550-1650	300-400	61-62
Silver Die No. 2	Firth Sterling Steel & Carbide Corp.	0.95	0.40	0.45	Tr.	Tr.	1550-1625	450-500	59-61



Quenching fixture for solid dies. The quenching medium is fed through the hole in the die so that this will be hardened while the outside remains soft

may be used, or lapping with abrasive and a copper rod may be resorted to. Uusally the die will become slightly bell mouthed in hardening, and will develop a constriction at the center. This must be allowed for when boring the original hole.

It is essential that the hole be absolutely concentric with the O.D., and it should be highly polished. A die with warped or rough sides creates difficulties in ejection, and most of the trouble with scoring is attributable to this defect.

Heat treatment is highly critical, and the hardness and uniformity of the case is the most important factor in establishing die life. Even minor changes can frequently have surprising effects, and most die makers have their own particular little tricks, worked out by long experience. In general, however, the thickness of the case in the hole should be about 0.125 in. and the hardness about 60 Rockwell. The end faces should be hardened over an area slightly larger than that of the head to be upset. The body of the die should be about 40 Rockwell.

For quenching, it is necessary to use a special fixture in which the die can be held while the quenching medium, usually water or brine, is forced through the hole at a pressure between 50 and 75 psi. The water exit is usually throttled to prevent any venturi action, the hole at the exit being about 25% smaller than the hole in the die. This will cause a partial back flow of the water and build up a pressure on the wall of the hole to insure thorough quenching. Some makers find it advisable to allow the water to flow for 8 to 10 sec., and then immerse the entire fixture in water while keeping the stream flowing.

When very long runs are contemplated, excellent results can be obtained with cemented carbide inserts. The life of such dies is very high, but their relatively high cost restricts their use to long run jobs. Usual practice is to purchase such dies ready-made from the carbide manufacturer.

Good results can also be obtained by the use of tool steel inserts hardened and shrunk into the holder. Care must be taken in selecting a steel for the holder to see that it has sufficient shrinkability to grip the insert firmly. SAE. 4140 is usually recommended for this purpose.

In most cases, dies are made double ended, so that when one end becomes bell mouthed through wear, the die can be reversed and an equal amount of service obtained from the other end.

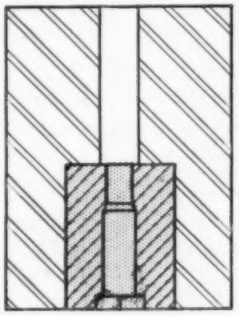
Open dies are made from two rectangular blocks of steel. Each block is machined all over, and then the two are placed end to end and a half-round groove is milled down the length of each of the four sides. The groove is slightly smaller than the diameter of the workpiece to allow for grinding. Matching sides are numbered. After hardening, the blocks are again placed end to end and ground all over. Usual practice is to grind the half holes in line, with a form wheel, but if there are counterbores or other cavities, the two halves are matched in a fixture and ground on an internal grinder.

As open dies must grip the wire, pinch is provided by grinding about 0.002 to 0.003 in. below the absolute center. Sharp edges at the grooves are stoned off to prevent cutting into the wire, but this must be done carefully to avoid forming a groove into which the wire will be forced and a ridge created.

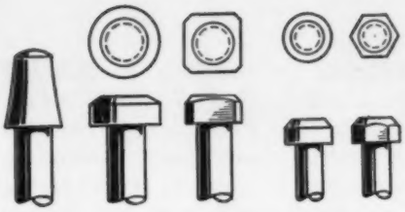
As mentioned above, the rear face of open dies acts as the cutoff, and hence if there are any cavities in the die face, open dies cannot be turned end for end.

Punch Design

Depending upon the design of the part, the header dies may or



Cemented carbide heading die inserted into a machine steel holder. This die is designed to extrude the lower portion of the work



Hexagon or square heads are produced by upsetting to a round head, and then trimming to shape in a special trimming press at a second operation

may not include cavities for shaping the part. Most simple head forming is done on the face of the die, with a cavity in the punch creating the shape of the head. This is the usual practice in forming standard button head rivets. For countersunk head parts, however, the cavity is formed entirely in the die, and the head of the punch is flat. Sometimes the head is formed partly in the die and partly in the punch, but when this is done the minimum permissible length of shank will be greater by the depth of the die cavity than that permissible with a flat-face die.

If two or more diameters are required under a head, and the differential is greater than can be obtained by extrusion, the head is formed by the punch, and the underhead diameters are upset to size within the die cavity. Whether in the punch or the die, cavities should be of round, or aproximately round, section. Squares or other shapes can be formed to only a limited extent, and the corners will be rounded to a considerable degree as the metal will not flow into a square corner. Square and hexagonal head bolts are produced by heading to form a round head, and then trimming to the required shape in a second operation in a trimming press.

To form a collar, the punch is bored out to a close fit for the stock to a depth corresponding to the distance from the end to the face of the collar. A cavity may or may not be used, depending on the shape of the collar.

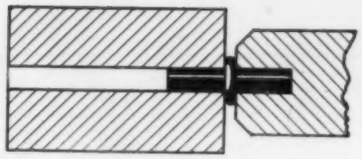
On a single-stroke machine the cavity in the punch or die corresponds exactly to the shape and size of the finished part, but when two or more strokes are used this shape is obtained only in the final stroke. The first and intermediate punches are then known as coning punches and serve to gather the metal into an approximately conical shape, leaving it tapered at the end, and allowing it to partially head next to the die. Coning-punch design is critical, particularly in difficult jobs. A very close approximation of the size of the coning-punch cavity can be made by the use of the formula given herewith, but there are a number of intangibles to be reckoned with which may necessitate corrections in size. Common practice is to leave the punch soft, make one piece, and then correct the punch if necessary before hardening. The same steel is generally used for punches and dies.

The function of the coning punch is to start the metal swelling outward so that when the final blow is struck the metal will continue to flow in the desired direction, and not merely collapse. This is particularly important since properly controlled grain flow is the factor chiefly responsible for the higher strength of cold headed products over those produced by machining from bar stock.

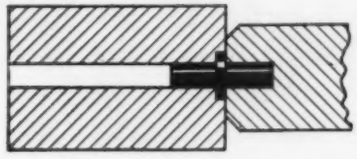
Piercing Operations

Piercing operations can be performed readily on cold-heading machines, and are very widely used for the production of screws with cruciform screwdriver slots, and similar struck slots. Metal slugs are sometimes cut off and pierced for drawing into short lengths of tubing. In such cases concentricity limits are usually very close, and as the punches are relatively slender, breakage will occur unless special precautions are taken before attempting to pierce.

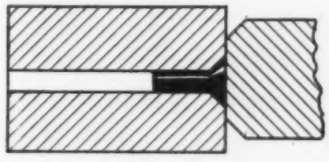
The machine should be carefully checked for play in the header slide, or any misalignment of the tools. These must be positively locked when the slide is in the forward position, as any sag or wiggle will inevitably break the punches. The usual way to check for alignment is to advance the punch just far enough to lightly indent the end of the stock, and then back away the punch, remove



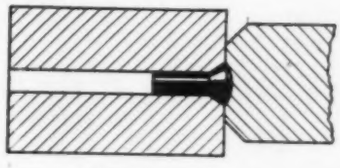
Forming a collar without the use of a cavity will give satisfactory results if the radius on the O.D. is not objectionable



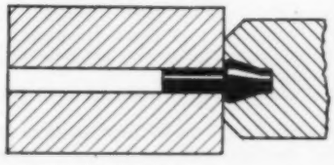
Square edges on collars necessitate the use of a cavity in either the punch or the die to control the shape



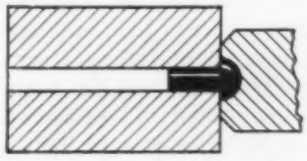
Flat countersunk head parts are made with the cavity entirely in the die, and use a flat punch



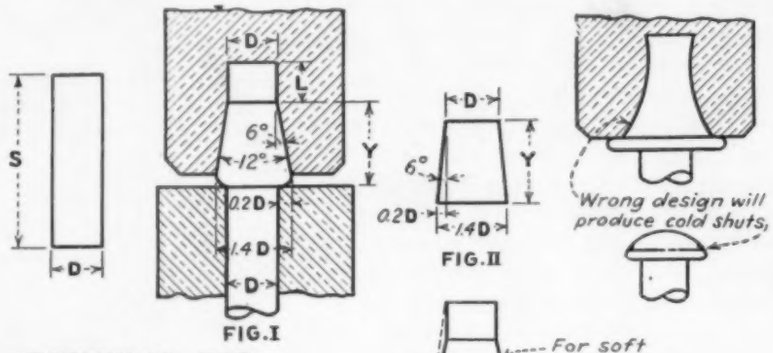
Oval countersunk heads are produced partly in the die and partly in the punch



Coning punches start the upset of the material. On large or difficult heads one or two coning punches may be needed



Round head parts are formed in a flat-face die, with the entire cavity in the punch



FORMULAS FOR

Coning Punches

FORMULA 1

$\text{Tan } 6° = \frac{0.2D}{Y}$

$0.1051 = \frac{0.2D}{Y}$

$Y = \frac{0.2D}{0.1051} = 1.903D$

FORMULA 2

Volume of Cone Fig. II

$\text{Vol.} = 0.2618Y\left(\frac{2}{D} + D \times 1.4D + \frac{2}{1.4D}\right)$

$\text{Vol.} = 0.2618Y\,(4.36D^2)$

$= YD^2\ 1.1414$

FORMULA 3

$\frac{\text{Vol. of Cone}}{\text{Area D}} = \text{Length of D wire to make cone}$

$\frac{1.1414\,YD^2}{\frac{\pi D^2}{4}} = 1.453Y$

FORMULA 4

$\frac{\text{Length}}{\text{Wire dia.}} = \text{No. of diameters in cone portion}$

EXAMPLE:

Let D = 0.375 in.

From Formula 1. $Y = 1.903 \times 0.375 = 0.71358$ in.

" " 2. $\text{Vol.} = 1.1414 \times 0.7136 \times \frac{2}{0.375} = 0.0114489$

" " 3. Length $= 1.453 \times 0.71358 = 1.0368$ in.

" " 4. No. of dia's. $= \frac{1.0368}{0.375} = 2.76$ dia's. of wire in Fig. II

Where base of cone = 1.3 D then (4) = 1.9 dia's.
" " " " = 1.4 D then (4) = 2.76 dia's.
" " " " = 1.5 D then (4) = 3.76 dia's.
} Irrespective of D

To length of wire from (3) add straight portion L to obtain S, or total length of wire in cone.

Coning-punch design can be approximated by use of these formulas, but trial and error usually decides the final pattern

the blank, and rotate it in a collet while checking the concentricity with an indicator.

The tools should also be checked to see that the face of the die is square with the hole and that the hole and counterbores, if any, are concentric with the die body and with each other. The front face of the punch must also be square with the body, the portion of the tool impression that forms the top of the head must be at right angles to the axis of the punch, and the base of the punch must be concentric with the tip.

If all these conditions are met, side strains on the punches will be eliminated, and piercing operations can proceed at the same rate as ordinary heading.

Cold heading should not be confused with bolt making. The function of the cold header in bolt making is merely to upset the end of the stock, and, if necessary, to extrude the shank in preparation for thread rolling. To manufacture a bolt it is necessary to perform additional operations, including trimming the head to shape; forming the chamfer on the shank end; grinding the shank, if necessary; and cutting or rolling the thread. Special boltmaking machines are available, however, which cut off, extrude, head, trim, point and roll the threads automatically producing a finished bolt or screw with each stroke of the machine.

Nail making also involves a different technique and although this is a cold-heading operation it is performed on special machines. In this case the wire is fed through open dies which grip it very firmly. There are usually several teeth in the die to assist in gripping, and these produce the characteristic notches just below the nail head. The head is formed in a single blow on the end of the wire coil. After heading, the wire feeds forward and is cut off by special nippers to form the conventional diamond point. When special points are required a second pointing operation must be performed.

The scope of cold heading is almost unlimited, and when used in conjunction with second operations it is capable of making tremendous reductions in material and labor costs as compared with screw machine production.

We Acknowledge . . .

The assistance and cooperation given by the following firms in making possible the collection of data

Ajax Manufacturing Co.
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Jessop Steel Co. Wm. Jessop & Sons
John Hassall, Inc.
Latrobe Electric Steel Co.
National Machinery Co.
Charles Parker Co.
The Torrington Co.
Waterbury Farrel Foundry & Machine Co.

Why You Cannot Get Ahead As Your Father Did —

THE UNITED STATES is being forced toward socialism by a tax revolution of far-reaching consequences.

We have not yet felt fully the deadly impact of this revolution because inflation and the postwar boom have delayed its effects.

But from now on, more and more people will feel its bite. Already it is the dominant element in our economic life. Already it is the major factor in our chances of keeping our jobs and of getting ahead.

Here are some pertinent facts on this tax revolution:

1. The tax load that our nation can safely carry has long since passed the danger point.

Our capitalistic system is in real danger when taxes take more than 20 percent of our national income (or 20¢ out of every income dollar). Beyond that point there are not sufficient dollars left in private hands for capitalistic America to raise the capital required to keep its industry going. So we are right now being nudged further and further into socialism.

For today taxes take *twenty-five* percent of national income (or 25¢ out of every income dollar).

2. The tax revolution has undercut the incentives that help us to get ahead.

The group whose incomes range from $5000 up now turns over about one-half of its *total* income to federal, state, and local tax collectors. Before the war, this group gave the tax collectors one-third of its collective income.

In sharp contrast, the group of people with incomes under $5000 pays the tax collectors 20% of its income for direct and hidden (mostly hidden) taxes — against 18% before the war. This lower-bracket group needs immediate tax relief but I believe most sincerely that persons earning less than $5,000 have a very vital reason for also supporting tax relief in the much more heavily hit upper brackets.

As you get ahead, you expect your taxes to go up. Taxes should be levied, in principle, according to ability to pay. But today tax rates rise so sharply that they virtually destroy all incentives to get ahead, to save, and to invest in new and untried enterprises that open up new jobs. *The progressive tax idea now carried to punitive extremes has become a destructive tax revolution.*

Today the U.S., envied by all the world for the wealth it has won under capitalistic incentives, has cut its incentives below those offered by that state whose police methods strike terror into the hearts of all workers.

Soviet Russia rewards successful managers, writers, and scientists better relatively than we do under our present tax system.

A revolution that sweeps away incentives will quickly sweep away our free enterprise economy. The only substitute ever found for free incentives is the whip-and-lash compulsion of the police state. And no police state has ever been able to match the production of a free people with a free economy that gives adequate rewards to individual producers.

3. The tax revolution hits squarely the average American's chances of keeping a job and of getting ahead.

If you make less than $5000 a year you may well ask why you should worry about a tax revolution that seems directed at the comparatively small group, about 10% of American families, who make $5000 a year or more.

The answer, it seems to me, is that "risk capital," the money that makes new jobs when invested in growing companies or in new businesses, must come largely from the people making more than $5000 a year. The others usually cannot afford to take any risks with their savings.

It was the savings of this 10% group that made possible the huge growth in American industry and American jobs and our progress in raising American living standards in the years before 1930.

Now the government is taking so much from the 10% group in taxes that they cannot afford to risk any savings they manage to accumulate. Most of their savings now go to insurance companies and savings banks which are barred by law from making risky investments or investments even in seasoned common stocks.

The flow of risk-capital from this 10% group can only be renewed by reducing their taxes. The result will benefit everyone over the difficult years to come by providing more and steadier employment for all.

The cost of the presently proposed reduction, *less than 1% of the national income,* can well come out of current revenue surplus. It will be repaid many-fold by the new enterprises it will stimulate.

4. Jobs will be lost if risk-capital does not increase.

Unless the flow of risk-capital into business *can be doubled* and *trebled* in the next few years, business investment in job-making new plants and equipment will drop sharply. The McGraw-Hill survey of prospective capital expenditures, reported in the previous editorial in this series, made that quite clear.

When such a drop in business investment has come in the past, it has brought with it a general slump in business – and unemployment.

As we work through the enormous demand for goods of all kinds built up during the war years, and as the war-accumulated savings of businesses and individuals are spent, it will be harder and harder to keep production and employment at today's high levels.

Then—at the very time that we shall need all our drive to maintain prosperity—we shall be hit by the full impact of the tax revolution.

5. Compounding these troubles is a tax system as out-of-date as an oxcart.

Twenty years ago, when taxes took only twelve cents out of the national income dollar, our rattle-trap tax system was little more than a nuisance. Today, when it takes twice as big a bite, its double-taxing of the earnings of investors, its discriminatory excises, and the overlapping of federal, state, and local levies are a fatal handicap. A new system, a fair system, a rewarding system, is a necessity if American initiative and enterprise are to have a fair chance.

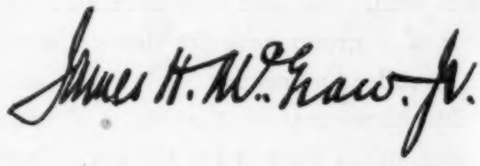
What Congress does now about federal taxes will bear crucially on our ability to sustain prosperity.

By demanding economy in government and by re-designing the tax system to stimulate initiative and risk-taking, Congress can multiply many times our chances of maintaining full employment and of raising living standards.

By allowing people to save more and by renewing the incentive to risk capital in new enterprises, Congress can actually insure a bigger tax return in the years ahead. More business will result – and pay more taxes.

That is the only way that a free people with a free economy can carry the tax load.

That is the best way that our government can improve our chances of keeping our jobs and of getting ahead. I suggest that you discuss these vital matters with your chosen representatives in Congress, in your state government, in your local community.



President, McGraw-Hill Publishing Company, Inc.

THIS IS THE 66TH OF THE SERIES

With no apparent rush, operator loads piston and connecting rod into machine at Station 1 and positions them with locating pin operated by his left hand. Piston pin is placed on shelf ready to be pushed into position at Station 2. Two helpers are required to keep operator supplied with parts

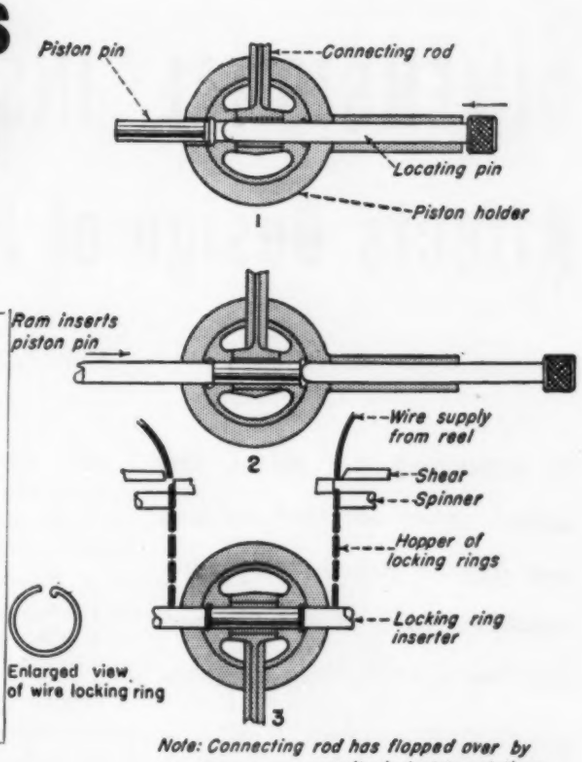
Lock rings to retain pin in the piston are formed opposite Station 2. Two coils of wire suspended overhead feed the machine. When wire is cutoff and formed, rings fall into place at Station 3 where they are pushed into grooves at each end of the piston-pin hole. The assembly falls out by gravity at Station 4 onto conveyor belt. Covers have been removed from the machine to show cam mechanism

Pistons and Con Rods Machine-Assembled

BY CHESTER S. RICKER, Detroit Editor

Assembly of piston, connecting rod, and pin, and installation of locking rings is performed in a new machine at the Rouge Plant of the Ford Motor Co. About ten assemblies a minute are made by the machine in a workholder with six stations. Only four of the stations are used.

This method eliminates not only the labor involved in hand assembly, but the 100% inspection that was required to make sure locking rings had been properly inserted and secured. The assembly machine does its own inspection by stopping if it cannot insert a lock ring properly.



Four operating stations of the machine. A cam swings the locating pin aside between Stations 2 and 3 so the locking rings can be inserted. Forming mandrels and cutoff shears are on each side of the work carrier. Former rings are caught in small hopper and gravity fed to the inserters at Station 3

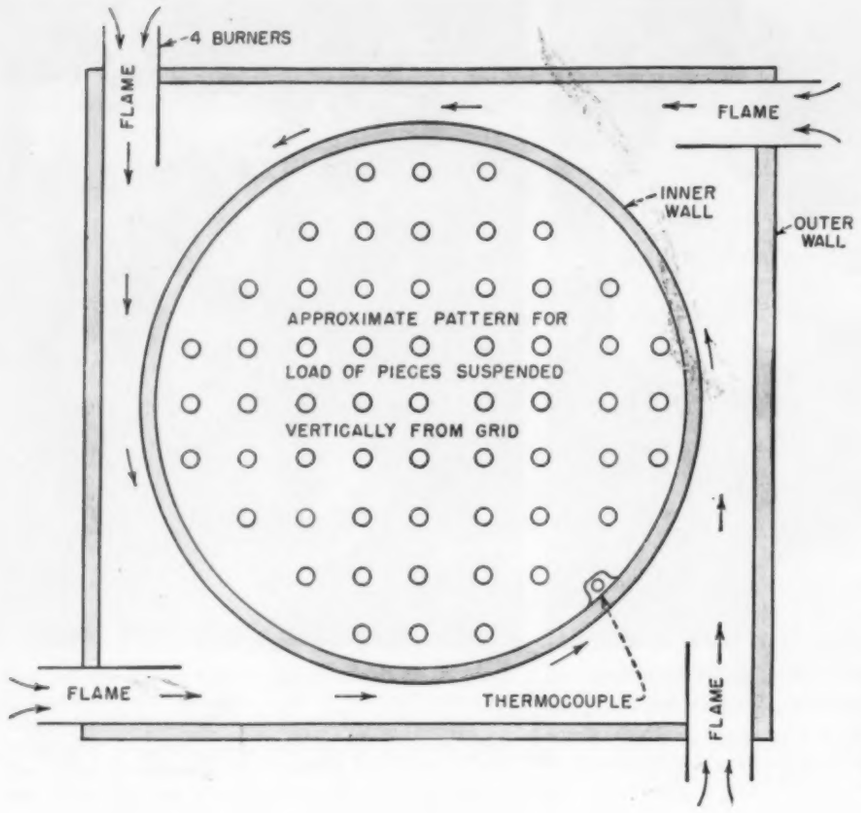


Fig. 16—Warpage of steel shafts was traced to a serious variation in the temperature at center and wall of a vertical furnace (shown in cross-section). The 50 F. gradient exceeded the austenizing range of the steel involed. Satisfactory pieces were obtained by a change in heat-treating method.

DIMENSIONAL INSTABILITY

Affects Design of Precision Equipment . . . IV

BY FREDERICK C. VICTORY, CHIEF ENGINEER, MOORE SPECIAL TOOL COMPANY

In concluding this series, the author points out that residual and applied stresses play very important parts in stability and functioning of machine elements

INSTABILITY can result, and frequently does, from residual stresses in material. These stresses may either be inherent in the material as supplied by the manufacturer, or be introduced during fabrication of finished products.
achieving ultimate and permanent

Two basic types of residual stresses are commonly encountered in materials: those resulting from cold-working processes, and others of a thermal nature. Each type may be complicated by a cumulative effect and the introduction of additional factors.

Processing methods that leave material in a stressed or unstable state include casting, forging, rolling, drawing and extruding.

During fabrication of the finished part, machining, heat-treating, press-fitting and welding may further reduce the possibility of achieving permanent accuracy.

Consideration of stresses in relation to dimensional instability should not be limited to the finished product, but should also include operational processes during manufacture.

By control or elimination of stresses and their attendant danger of distortion during processing, economy in manufacture and a greater assurance of completion within an acceptable permanent standard of accuracy will result.

Fundamentally, there is but one type of mechanical stress resulting from cold working and its attendant strain hardening; namely,

tension. But there is a considerably more complex situation arising from stresses of thermal origin. These may be related to cause:

For Steel

1. Incomplete conversion to austenite, because of a thermal gradient within the furnace or insufficient time for the entire piece to reach heat.

2. Retention of austenite, caused by exceeding the correct austenitizing temperature range, incorrect or incomplete quench; the choice of a steel particularly prone to retain this undesirable constituent.

3. Non-uniform cooling, resulting from abrupt difference in section or unequally distributed quenching effect.

For Other Metals

1. Casting stresses caused by non-uniform cooling.

2. Welding stresses arising from a combination of the previously outlined factors.

3. Localized heating such as encountered in grinding operations.

All of these can be rationalized as a nonhomogeneous volume change or phase transformation within the temperature range of cold work.

It is a well known fact that elevated temperature generally permits stresses to dissipate themselves, and that, conversely, lower temperatures resist this trend. Consequently, residual stresses will be induced by any volume change that does not occur simultaneously throughout the mass, and at a temperature at which the metal is capable of yielding.

A case example will indicate the subtlety of this form of instability.

The workpiece was a 1⅛ in. cylindrical section of oil-hardening tool steel, symmetrical in design and 32 in. long.

For heat-treating, the pieces were suspended vertically and distributed equidistant from each other in a vertical convection furnace, Fig. 16. Temperature control was maintained by pyrometers.

The quenching method consisted of carefully lowering the load, without swinging, directly into a gently agitated oil bath. In spite of all precautions, warpage amounted to 0.125 in. in some pieces.

Exploration of the thermal gradient in the furnace, by placing thermocouples at various distances from the center of the cylindrical furnace chamber, showed a temperature difference of 50 F. from center to wall. This gradient considerably exceeded the recommended austenitizing range of the steel.

An obvious conclusion was drawn: Certain pieces were incompletely austenitized and therefore were highly stressed during the phase-volume change on quenching. Others retained excessive percentages of austenite because of overheating. This case demonstrates the care necessary to avoid stresses during processing.

Use of a furnace with more uniform chamber temperature was the obvious corrective measure. Basically, two types are suitable: either a forced-convection atmosphere furnace or salt-bath furnace.

Elimination of temperature variation during austenitizing resulted in a marked decrease in distortion of workpieces and greater uniformity of hardness after quenching. Nevertheless, the bowing after quenching exceeded 0.020 in. in a large percentage of the work. This amount was considered abnormal, but the cause was not immediately apparent.

Study of the cycle, with emphasis on handling methods employed during quenching, revealed that the work was carefully lowered into a large rectangular tank, Fig. 17, where it was gently agitated vertically in the oil until violent turbulence subsided. The work was then moved horizontally in the oil to a position at the other end of the tank, where the pieces were racked and allowed to remain until room temperature was reached.

Analysis of this cycle revealed that the immersed, horizontal movement must necessarily produce a temperature variation from one side of the workpiece to the other.

Flow lines of the oil around the cylindrical surface, Fig. 18, explain the reason for a differential between temperature of the leading face as compared with the following face.

Since this condition was imposed at a critical stage of quenching, abnormal distortion resulted.

The horizontal movement of workpieces, while immersed in oil,

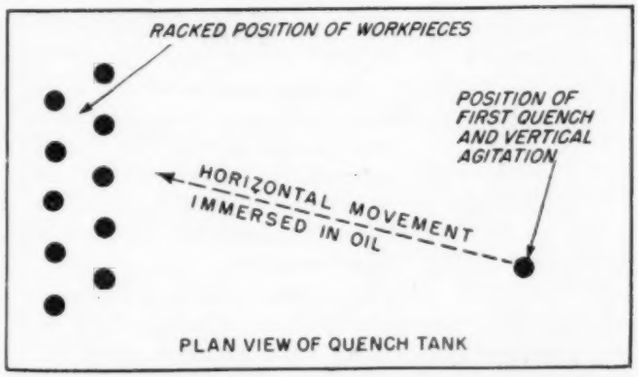

RACKED POSITION OF WORKPIECES
POSITION OF FIRST QUENCH AND VERTICAL AGITATION
HORIZONTAL MOVEMENT IMMERSED IN OIL
PLAN VIEW OF QUENCH TANK

Fig. 17—Schematic flow lines of oil past slowly moving workpiece show that one side was cooled faster than the other, thereby causing distortion.

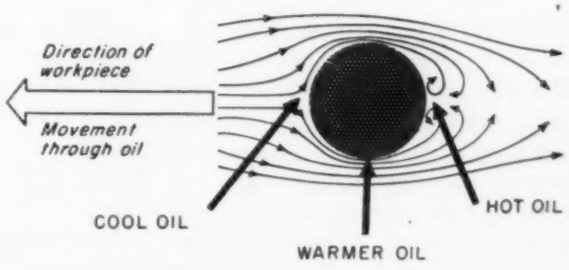


Fig. 18—Shafts were originally immersed vertically in the oil quench thank then mowed gently under oil to the racking position.

was eliminated from the cycle. Instead the work was vertically removed from the quenching position after nearly complete cooling, and then gently moved in air to the racking position. After approximately 20 min. the pieces were again moved to another oil tank, in which they were suspended for an additional 30 min. in slightly cooler oil. After this change in procedure an entire lot of 46 pieces was hardened with an average bowing of 0.009 in. in the 32 in. length. In no case was the 0.020 in. maximum permissible bowing exceeded.

This example demonstrates that distortion during hardening (a form of dimensional instability) requires infinite care in respect to details, and in establishing methods for detecting and correcting the problem.

There are three approaches to the problem of residual stresses. Obviously, the first step should be elimination of conditions promoting stresses if possible. When corrective measures in this direction have been exhausted, one must turn to stress relief by application of heat, and the utilization of corrective deformation

For unhardened work, annealing at high temperature (for carbon steel, 925 F.) followed by slow cooling will completely remove residual stresses, and it is the most practical solution. But this technique cannot be applied to hardened steel without some loss of hardness.

Repeated Cycles Effective

Fortunately, when applied to hardened steel, lower temperatures and repeated cycles of heating and cooling are very effective in removing a large percentage of residual stresses. By keeping just below the drawing temperature for the steel, satisfactory results are obtained.

For precision applications where close tolerances are to be attained, the raw material should be stress-relieved before machining. After rough machining it should again be stress-relieved, and occasionally it may be necessary to repeat the cycle several times during processing.

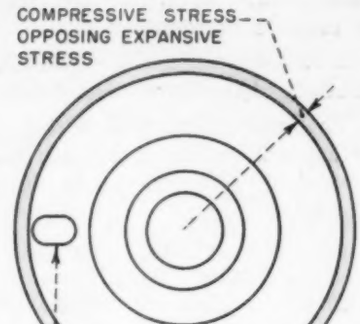


Fig. 19—By shrinking a ring on the periphery of a high-speed pneumatic-turbine rotor, growth of the latter by centrifugal force was overcome, and running clearance maintained

Corrective deformation usually implies peening or bending, both methods being applicable to hardened work, the latter usually being the choice for soft work.

Frequently it is possible austenitically to straighten work at a point in the quench cycle just below the *M* point, and before transformation has progressed to any considerable extent, with a resulting decrease in stress.

How It Is Done

Fundamentally, this method consists of quenching the work down to the point where the formation of martensite is well under way, and then removing the work for straightening. The work may then be returned to the quenching bath or merely allowed to continue cooling in air. As a result of this method, the degree of plasticity of the steel during straightening is considerably higher than would be the case were the operation performed at a stage when the structure was almost completely martensitic. The net result is a marked decrease in the stresses set up and a minimization of the danger of cracks or fractures.

This effect can be produced because the austenite→martensite transformation is not isothermal but continues during cooling below the *M* point. As a matter of fact, once the entire piece is safely quenched to the *M* point, the rate of continued cooling is relatively unimportant. The reaction, having been started, will progress even during air cooling. However, this method is prone to increase slightly the tendency to retain austenite.

Slow deformation of finished parts resulting from gradual relaxation of residual stresses is a serious threat to dimensional stability and deserves careful consideration on the part of design and methods engineers.

Applied Stresses

Some question might be raised concerning the appropriateness of including external forces, such as applied stresses, in a discussion of dimensional instability. Mention of them appears to be justified. Actually, the phase to be discussed constitutes a reversible reaction that in some respects parallels thermal expansion.

Applied stresses may be defined as those resulting from the application of some external force or load. The net result is a stress which may be tensile, torsional, compressive or flexural in nature. In any case, the resulting deformation is identified with dimensional instability.

Deformation may occur within the elastic limit of the material, and therefore be temporary in nature dependent on relaxation of the load, or result from the load having exceeded the elastic limit, and thus be permanent.

A discussion of ultimate strength in the range between the elastic limit and the ultimate yield point is not within the scope of this article. Consideration of deformation will be limited to that arising from stresses within the elastic limit.

For any given section of a workpiece, deformation is approximately proportional to the load or stress applied. In the case of steel, hardening has virtually no effect on this ratio, contrary to the popular misconception.

The most practical approach to the problem of dimensional instability as a function of stress deformation lies in the choice of a material of suitable modulus of elasticity and section.

Comparatively little recognition has been accorded the extremely high modulus of elasticity common to the cemented carbides, whereas this property offers a very satisfactory solution in many applications where extreme stiffness under moderate loads is a prime requisite.

There is no appreciable difference in the variety of types of steel insofar as modulus of elasticity is concerned, and only a nominal difference between them and other ferrous metals. This being the case, and other factors dictate the choice of ferrous material, the only recourse lies in increasing the cross-sectional area and utilizing a section shape best suited to resist the stresses applied.

Which Sections Are Best

For example, a cylindrical section is the most economical shape for resistance to tensile loads, while a tubular or hollow section is best suited to support compressive loads. Sections developed to resist bending loads range from an I-beam for loads applied in one plane, to a tubular section as most effective in resisting loads in any direction.

The actual shapes and proportions for sections best suited to specific applications are given in engineering handbooks.

Not infrequently, counter stresses can be set up effectively to minimize or neutralize deformation resulting from anticipated and predictable loads. This principle can best be illustrated by citing a typical application by the Moore Special Tool Company.

The problem was an increase in diameter of a high-speed turbine rotor as the result of centrifugal force. The clearance between the outside diameter of this rotor and the inside diameter of the housing in which it rotated must necessarily be held to a minimum under all conditions.

By the simple expedient of shrinking a restraining ring on the periphery of the rotor, compressive stresses of a high order were set up, Fig. 19. Before any diametral increase could take place, the forces set up by high-speed rotation would necessarily have to exceed those set up by the shrink fit —a condition not fulfilled in operation. The net result was a satisfactory degree of dimensional stability in this member.

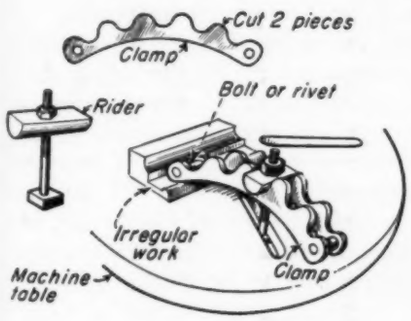
Conclusions

One inescapable conclusion must be drawn from the evidence of dimensional instability resulting from widely dissimilar causes. It is this: Dimensional instability cannot be eliminated from consideration as a design factor where accuracy within close limits is the objective.

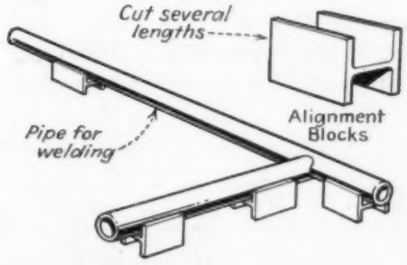
This four-article discussion of the various aspects of this phenomenon—causes, manifestations and proposed methods of combatting it—by no means covers the extremely broad scope of the subject. It is hoped, however, that the series will familiarize the designer with the more commonly encountered forms of dimensional instability, and thereby alert him to the necessity of including this factor in his concept of design of precision equipment.

Short Cuts FOR THE SMALL SHOP

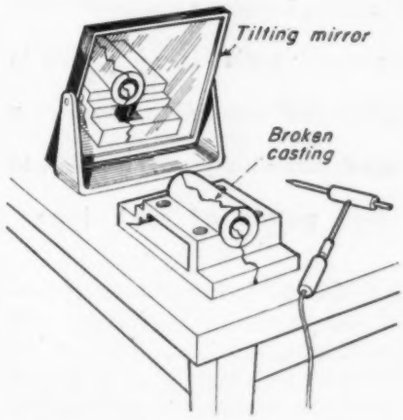
BY A. H. WAYCHOFF



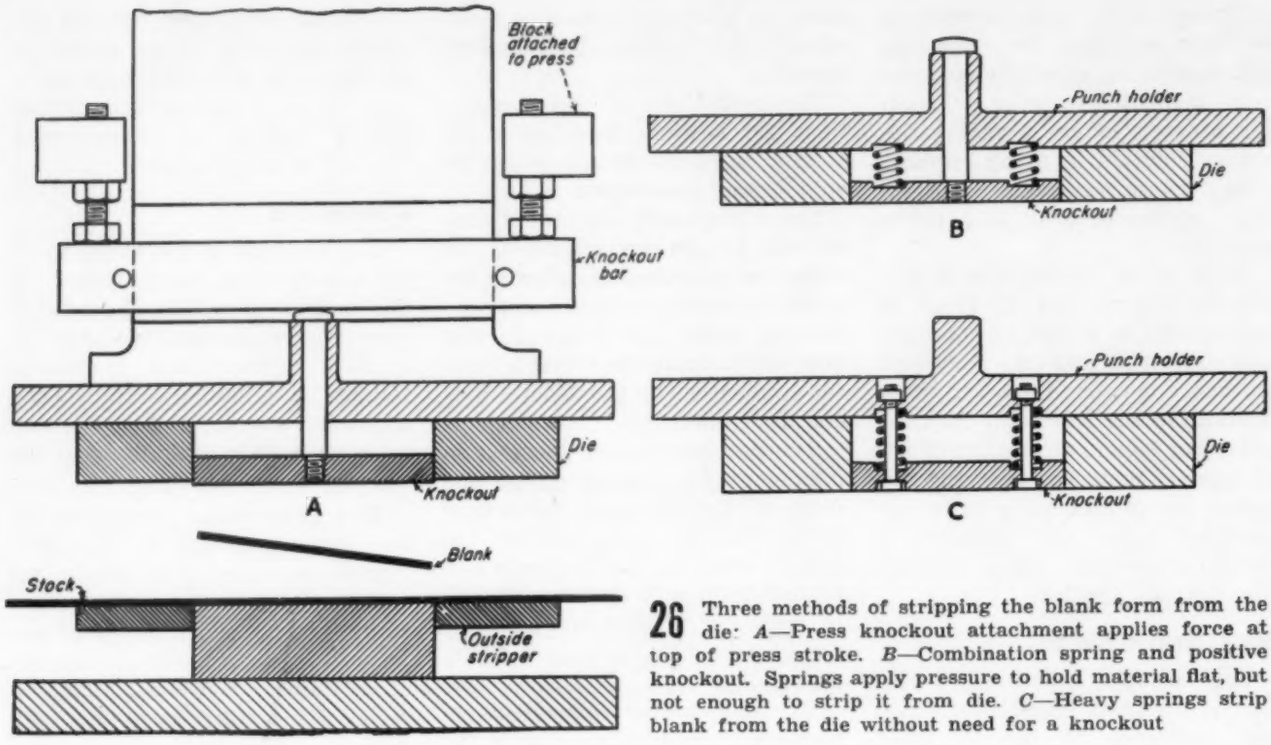
HANDY HOLD-DOWN clamps for irregular work can be made for use on T-slotted machine tables. Take some pieces of boiler plate and cut segments of annular rings. Burn some round-bottomed notches around the peripheries of the pieces. Dress with a file. Assemble pairs of parts with spacing bolts or rivets. The hold-down bolts can be made in two ways, but in both cases they have a "rider," or piece of bar stock sawed down the middle and long enough to span the side members of the clamp. One form may consist of a T-head screw, the rider and a nut: the second a machine screw passing through the rider and fitting a tapped hole in the table.



SHORT LENGTHS of H-beam or I-beam make good set-up blocks for welding pipe assemblies. The various pieces of pipe will be supported in correct alignment. Often, the blocks will have a capacity to take pipes of various sizes.



WELDING JOBS can often be speeded if the operator has a view of the rear as well as the front of the assembly. To secure this condition, place a tilting mirror, such as used on woman's dressing tables, in back of the work. This stunt will save time in arranging broken parts and during tackwelding.



26 Three methods of stripping the blank form the die: *A*—Press knockout attachment applies force at top of press stroke. *B*—Combination spring and positive knockout. Springs apply pressure to hold material flat, but not enough to strip it from die. *C*—Heavy springs strip blank from the die without need for a knockout

How to Get the Most Out of Punch Presses...IV

PIERCING AND BLANKING METHODS

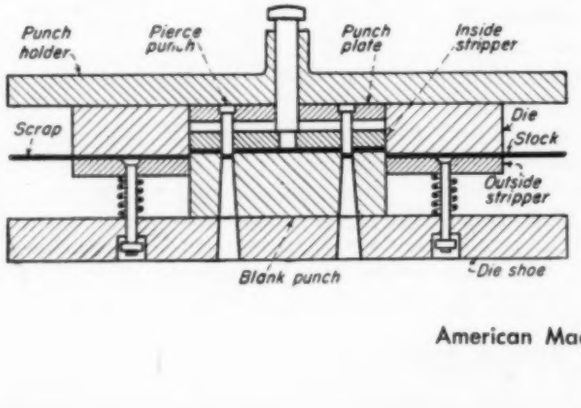
BY E. H. GIRARDOT PUNCHING, TOOL, AND DIE DIVISION GENERAL ELECTRIC CO.

Choosing between compound and progressive dies is a key step in economical operation, requires a sound knowledge of good and bad points of each type

SELECTION of the most economical method for piercing and blanking operations, both as to type of press and type of die, is one of the deciding factors in efficient operation. Whether to use an automatic or handfed press, or a compound- or progressive-type die, can only be determined by a comprehensive knowledge of the advantages and limitations of each, as applied to the job at hand.

A compound-type die (Fig. 25) is a single-station tool which blanks out a shape and pierces the required holes in it at the same time. It is an inverted-type die, with the blanking die and piercing punches mounted on the top holder. The blanking punch, made to include the pierce dies, is on the bottom, so that scrap slugs from the pierced holes fall through the press bed.

The sheet material is lifted off the punch by means of a spring stripper. This stripper may be provided with guides to feed the material and a stop to position it for the next stroke. The blank tends to remain in the upper die, from which it is removed by a spring stripper that leaves it on the sheet material, or by a positive knockout which strips it from the die near the top of the stroke, so it can be removed from the punching area by an air blast.



25 Compound piercing and blanking die. This is the inverted type, with the blanking dieblock mounted on the punch holder

Advantages

Maximum accuracy of relationship of pierced holes and blank contour can be consistently maintained, regardless of the kind and thickness of material being cut. The blank is made complete in a single station with a single stroke of the press, and therefore will reflect the accuracy with which the die is built. The manner of cutting and the omission of angular die clearance both contribute to continued accuracy.

Flatness of the blank is insured, through the manner in which the material is kept flat during the cutting cycle. The material is held securely to the face of the upper die through pressure from the spring stripper surrounding the lower punch. The actual blank is pressed to the face of the lower punch by the knockout plate or spring stripper located inside the top die. In operation, the strippers contact the material and hold it to the punch and die faces prior to the start of actual cutting. In this manner, the cutting action does not affect the flatness of the material, resulting in a blank of exactly the size of the die.

Although the punch (outside) stripper is always spring actuated, the stripper inside the die (Fig. 26) may be one of three types:

Positive Knockout—This type is best used when blanking relatively hard or heavy materials, which would tend to remain flat without assistance. The function of the knockout is then merely that of removing the blank from the die on the up-stroke of the press, by means of the standard press knockout attachment.

Combination Spring and Positive Knockout—This type is efficiently used when blanking thin and springy materials, and when flatness and accuracy are required. Just enough spring pressure is used to hold the material flat, but not enough to eject the blank from the die without the aid of the press knockout attachment.

Spring Knockout—This full-spring knockout assures maximum flatness and accuracy, since sufficient spring pressure is utilized to strip the blank from the die and leave it on the lower punch as the die opens. This method is generally used when the press has no positive-knockout attachment, or where the physical size of the blank is too large, in proportion to the press knockout, to eject properly.

Ejection of the blank from the die by spring or positive knockouts means that angular die clearance is unnecessary on the blank contour, assuring a constant blank size through the entire life of the die. Although this clearance must be provided on pierced holes (Fig. 27), bushings can usually be inserted which can be replaced when repeated grinds result in excessive clearance.

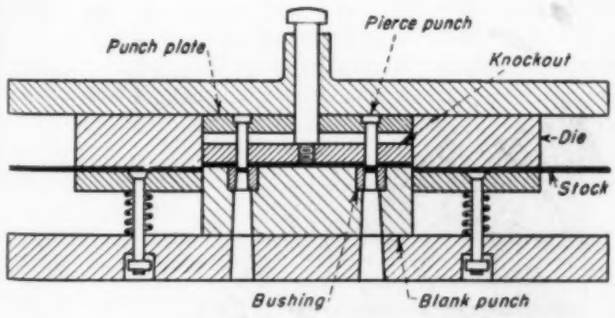
Limitations

The chief limitation of compound-type dies is slow operation, due to the retention of the blank in the upper die and the necessity of waiting for the upper member to rise before its ejection. In straight-side presses, the blank is usually allowed to fall on the strip of material. It is carried out and removed by hand as the material is positioned for the next stroke. In C-frame inclinable presses, the press is usually inclined and an air blast carries the blank to the rear of the press. This blast is timed from the press crankshaft to catch the blank as it is ejected from the die at the top of the stroke.

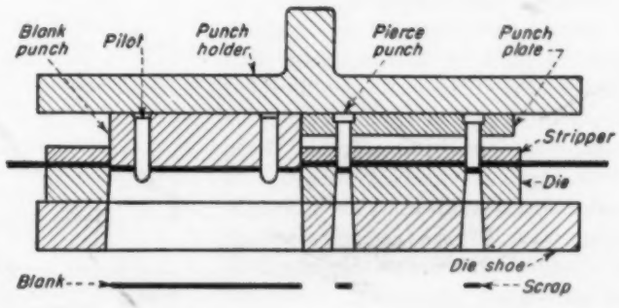
It is essential that the speed of the press be slow enough that each blank will have completely cleared the die before the next stroke starts. A manually operated press is recommended, because the operator can wait momentarily between each stroke to guard against the possibility of a blank failing to fall, or be blown clear of the die. In this event, it must be removed manually before the press is tripped again, to prevent cutting a double thickness of material, with subsequent die damage. For this reason, automatic presses are not recommended for compound dies in general.

Parts produced in compound dies are hard to stack automatically. Removal of the blanks from the die by means of air pressure does not allow good control of the average blank for stacking purposes. Special devices have been developed for this purpose, however, in applications where the blank shape and production quantity warrant the expense.

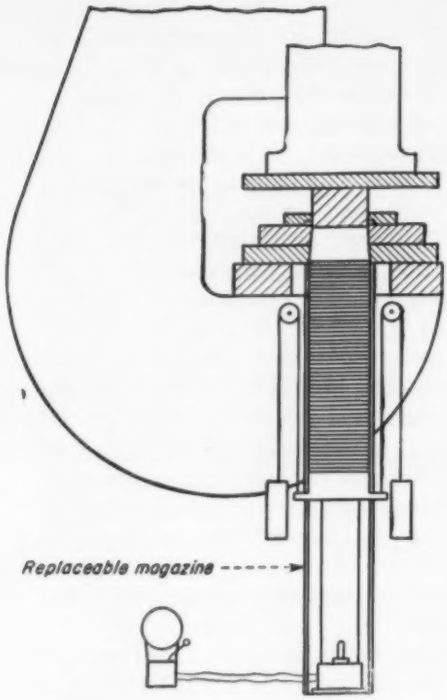
In general, compound dies in-



27 Compound dies have maximum die life because angular clearance is omitted from die block. Clearance angles must be included on pierce holes in lower punch but replaceable bushings can be used



28 General layout of a progressive-type piercing and blanking die. Part of the work is done at each station, with both piercing and blanking punches mounted on the upper holder or the dieset.



29 Stacking device can be attached directly to die shoe

volve more parts than progressive dies, and are more expensive to build. In addition, they are more expensive to keep in operation, because of their complicated nature.

Progressive Dies

A progressive-type die (Fig. 28) is a multiple station tool, wherein a portion of the work is done at each station. Both the piercing and blanking punches are fastened to the upper, or punch holder, while the dies are attached to the lower shoe. Both scrap slugs and finished blanks are thus pushed through the lower die.

The principal advantage of dies of this type lies in their speed of operation. They are particularly suited for high operating speeds in automatic presses, the speed being limited only by the rapidity with which the material can be fed from one station to the next. In addition, punchings from these dies lend themselves readily to automatic stacking, since it is only necessary to fasten a stacking magazine under the die opening (Fig. 29).

Lack of Flatness

Blanks produced in progressive dies do not maintain a satisfactory degree of flatness. Since the material being pushed through the die is not supported, it tends to "dish" into the hole in the die (Fig. 30), thus gathering extra material in the blank over the actual die size. This departure from a flat punching not only affects the accuracy of the blank contour but also may be objectionable in the design of the part, requiring an additional flattening operation at extra cost.

Accuracy of the relationship of pierced holes to the contour of the blank is dependent upon the accuracy of the means provided for locating the material on its move from station to station. The strip of material is approximately positioned by hand or automatic-feed between each stroke.

Pilots in the second stage position the strip by locating in holes or slots pierced in the first stage. In this manner, the pilot must necessarily pull the entire strip of material into position. Some variation in positioning can be anticipated between that attained when a heavy strip of material is first started, and that attained toward the end of the strip when it is lighter and easier to position.

Parts made from thin materials (under 0.020 in. in thickness), are extremely difficult to control with pilots. The material around the holes is not strong enough to resist bending under the pressure of the pilots as they attempt almost instantaneously to overcome the inertia in the strip of material and pull it into proper position. The same is true when punching very soft materials. In either case, the material cannot consistently be positioned accurately for the succeeding operation, thus inducing a discrepancy between the relationship of the work performed in each station.

Die life is considerably shorter than in compound-type dies, since angular die clearance is necessary in the die to allow the blank to be pushed through. As the die is ground, the physical size of the opening becomes larger (Fig. 31), automatically increasing the clearance established between the punch and die. This increase in the size of the die alters the size of the blank, and the increase in die clearance induces a burr condition that is difficult to control.

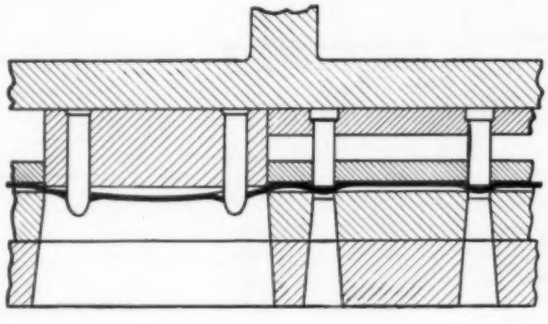
Other Factors

Certain other factors affect the overall economy that it is possible to obtain on pierce and blank operations, both on compound and on progressive dies:

Rigidity of Die—Press bolsters are provided with openings to allow the scrap slugs and, in the case of progressive dies, the finished blanks, to fall through. It is essential that the die shoe resting on the bolster be of such area and thickness as to be able to withstand excessive deflection under load. In the case of sectional dies, the individual sections should be so keyed and supported that they will not "spring" or open-up under cutting pressure.

It is occasionally necessary, particularly in the case of progressive dies, to allow the top holder to overhang on either side of the ram. In this event, the holder must be substantial enough to resist deflection in that portion which overhangs.

Choice of Die Steels—The many brands and types of die steels available make selection of the steels used a matter of opinion,

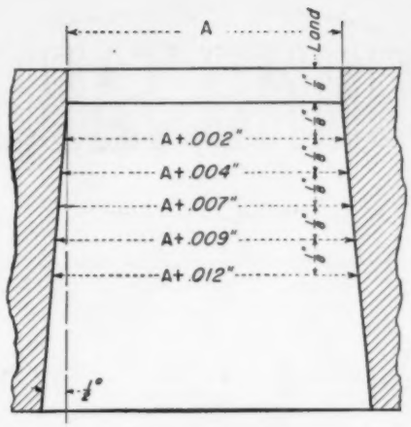


30 Deformation of material (exaggerated to show relative amounts) under cutting pressure in progressive dies

based on personal experience in similar applications. Uniformity of hardness of the punch and die sections, however, have a direct bearing on the number of punchings secured per grind, regardless of the type or brand of steel used.

The softest spot in the punch or die will wear fastest, and this spot becomes dull and produces a burr, while other harder sections are still sharp. To control premature die grinds, all hardened cutting edges should be carefully checked to insure that the softest points are of sufficient hardness to give satisfactory runs.

Certain die steels require special handling during grinding to prevent surface cracks and burning. Where steel with this characteristic is used, a metal tag giving the tool-steel identification should be permanently attached to the die to insure that proper grinding procedure will be followed when the die is reground.



31 Increase in die opening as material is removed by sharpening. The increased clearance causes burrs

Die Steels for Inserts and Bushings—Particular attention should be given to the choice and hardness of die steels used for inserts and bushings. Too often the inserts and bushings prove to be of a lower quality and hardness than the steel used in the punch or die. As a result, the entire punch and die must be reground, when actually only the inserts or bushings are in need of grinding. This represents a waste of die life which can readily be controlled by insisting that all inserts be of a type of steel and hardness which will insure as great, or greater life, than that of the material used in the punch and die.

Set-up Procedure—Proper set-up procedure is an extremely important factor in economical die operation. Theoretically, a die should be so set-up and clamped that the upper and lower members will be parallel to each other and in proper relation to assure that the die clearance is equally distributed around the entire contour of the blank. Careless and hurried set-ups should not be tolerated, as they can be responsible for a large proportion of die maintenance, and for short die life.

Part V, Die Design, will appear in an early issue.

HOW TO KEEP EMPLOYEES INFORMED

The Naugatuck Valley Industrial Council

sponsors radio programs and newspaper advertisements

to present the middle-of-the-road view

Industrial management has taken the offensive in Waterbury, Conn., to combat union propaganda and general misinterpretation by the public of our system of free enterprise.

Waterbury members of the Naugatuck Valley Industrial Council have for the past year sponsored radio programs and newspaper advertisements on a regular schedule. It appears that this experiment in public education will soon include all of industry in the Valley.

Advertisements have appeared once a week in the newspapers. A once-a-week radio program, supplemented by nine one-minute programs during the week, explains industry's side of the story as well as new laws and government actions.

Charges that the Taft-Hartley Labor Law was a "slave labor" bill were swiftly met by explanations of the law and the presentation of the fact that it was a law and could be changed only through normal process of law. The underlying idea of this effort was if the nation did not observe the law it could not expect to call itself a democracy.

Other programs have been based on profits, productivity, wages and prices, pointing out how labor, industry and the general public were affected in the long run by any changes in these four items.

Mechanization has been explained as a process which does not reduce manpower but causes an increase in the number of workers through additional products and resulting drop in prices which benefits all.

As to the value of this type of public relations, no results can be accurately tabulated. However, in the case of the Taft-Hartley Labor Law, many industrialists feel that union blasts against the law have been neutralized, if not completely overridden.

This educational program has been taken on by many concerns solely in their own plants, but the idea of public education—which includes the workers—is novel.

For some time, unions have run newspaper ads and leased radio time to explain one side of various questions. Waterbury programs, as put forth by industry, have been rigidly guarded to keep a middle-of-the-road characteristic, rather than presenting a strictly management point of view.

ROUND TABLE

Back Up or Back Out?

"Haven't you been deserting the shop quite a bit lately, Al?" inquired Ed, as they were strolling leisurely through Al's department. "I don't want you to think I'm butting in on your business, Old Man, but you can carry that thing too far, you know."

"Between you and me, Ed," laughed Al, "It's not lack of interest on my part that's made me do it. You no doubt have noticed that things run pretty smoothly when Billings takes over."

"Yes, things are clicking along all right enough; but aren't you afraid that he'll do a better job of it and sort of put you on thin ice?"

"More credit to me if he does, Ed. All I'm doing is making it possible for things to go along without me in case I leave or am laid up for awhile. You know, Ed, in this fast age, automobiles have a nasty habit of going over banks when you least expect it."

"Well, yes, there's that angle to be considered. But how come you picked Billings?" puzzled Ed as they stopped before a grinder. "He isn't the senior man here."

"Length of service makes no difference to me in this case," replied Al. "When it comes to picking a good man as a possible successor there are other things more vital than seniority."

"Oh, I'm not finding fault with Billings, Al; I think the fellow is good material for the job."

"You're darn right he's a good prospect. I've had my eye on him for some time. You may not have noticed it, but I've been testing that fellow out off and on for the last six months," Al confided. "His attitude is sound; he's tolerant—and furthermore, he has had a broad experience in his line of work."

"That's all very well, Al, but I still think that one should look out for Number One; you know some funny things have been pulled off by fellows who let their ambition get away with sound judgment—you get what I mean."

"Oh, yes, I get your idea and I'm taking that chance," Al replied seriously. "The thing I am concerned with most is that there won't be a cylinder missing if for any reason I should step out."

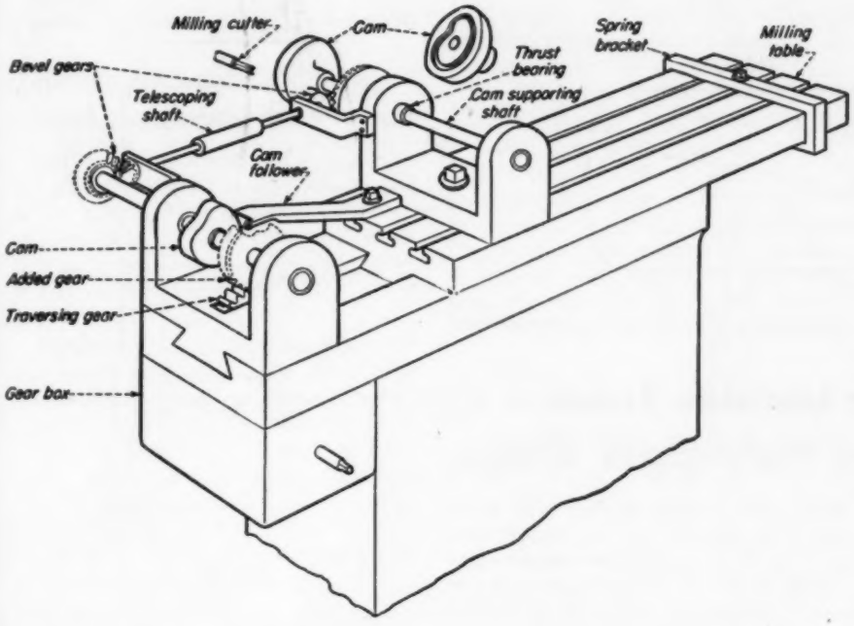
"That's very magnanimous of you, Al, I'll say; but still, I think you're sticking your neck out."

"If the plant is going to be more efficient by my doing so, I don't mind playing the part of a giraffe," laughed Al. "I don't see how I can get anywhere else if I haven't got a Number Two man to back me up here."

"You mean you're looking for a better job! I didn't think you had retirement or a hospital on your mind!"

IS PICKING a successor wise—*or foolhardy? Is it always best for the Number One man to have a Number Two? Does selection by seniority build more morale than selection by potential builds efficiency? Your answer to these questions will be appreciated by other readers. Discussions of earlier topics appear on later pages.*

Practical Ideas



Milling Machine Cuts Slotted Cams Using Removable Fixtures on Table

An old goose-neck Fox milling machine was converted into a cam-producing machine by the addition of a number of fixtures and extra parts to the milling table and traversing mechanism. In order to keep the mill in its original condition, all additions were made so they could be removed to allow the mill to be used in normal operations.

The cam, shown in the detail in the illustration, was a curved slot cut in the face of a plate cast with a keyway boss. The slot was milled with an end-milling cutter by moving the table, hence the cam blank, back and forth to follow a master cam as both master cam and blank rotated at the same speed.

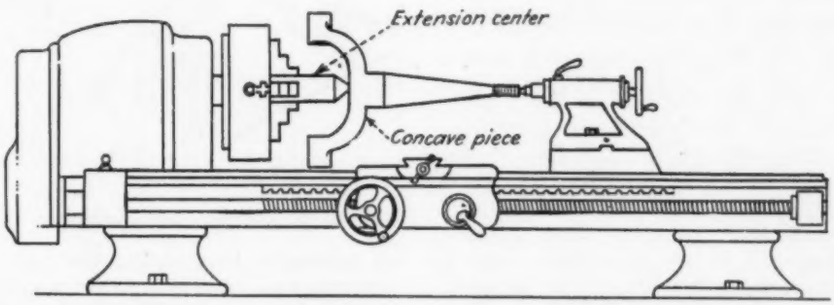
First the milling table was moved out to disengage its rack from the traversing gear in the gear box. Then a yoke and shaft carrying another gear, the master cam and a bevel gear was mounted on the exposed ways of the machine. A second yoke, mounted on the milling table, held a shaft carrying another bevel gear and the cam blank.

As the power rotated the traversing gear, the motion was transmitted through the first shaft to the bevel gear, through another bevel gear to a telescoping shaft, then through a second identical bevel gear pair to the second shaft which rotated the cam blank. The telescoping shaft and two identical bevel gears were held by two brackets fastened one on each yoke, so they would hold their positions and take the load.

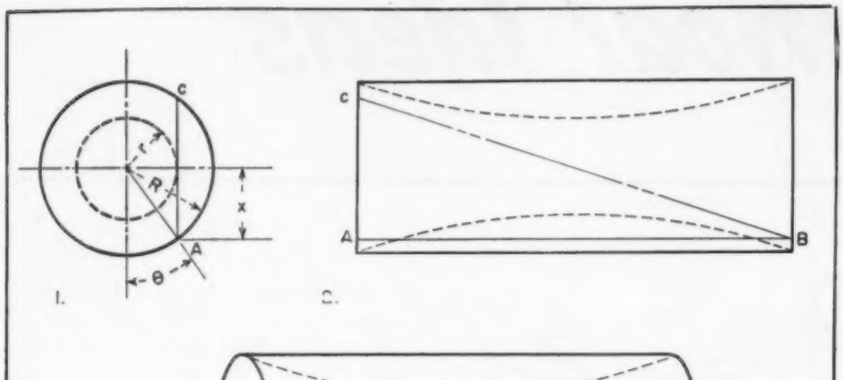
The cam-following mechanism consisted of an arm which held a roller, a spring bracket bolted to the milling table, and a heavy spring mounted between the under side of the machine proper and the spring bracket. As the master cam and blank rotated, the spring forced the roller and arm to follow closely the contour of the master cam, which transferred a reciprocating motion to the milling table and the blank.

Because of the heavy loads present in the mechanism due to the spring, the arm and cam-following roller were made very strong (size reduced in the illustration for clarity). In addition, hardened bevel gears, as well as a thrust ball bearing on the cam-blank shaft, were used to insure smooth operation.

The cutting of the cams was accomplished in three operations: two rough cuts and one finish cut. The first roughing cut was made to only half the 5/16-in. depth of the final cut with a cutter that was 1/32 in. under the final 5/16-in. width of the slot. *Frederick C. Lurz, Pelham, N. Y.*



Facing, turning and threading work with a large footed end can be accomplished by mounting it between centers as shown above. The automobile front wheel spindle was centerdrilled in the dished face and a center was chucked in the lathe head. The work can be driven by a special dog, or it can be reversed and dog-driven from the small end



Bar Setup on Planer Locates Trace Used for Turning Hourglass Shape

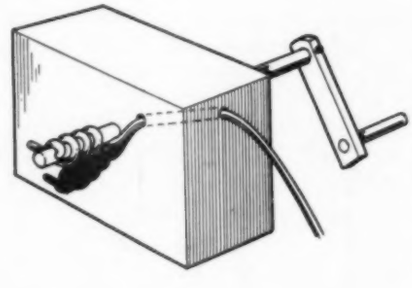
An hourglass shape is usually difficult to turn on a small lathe, but the use of a planer to trace the shape of the hourglass form on a piece of bar stock will greatly simplify the problem.

The O.D. of the bar is turned at the two ends in a lathe. The bar is then set up in V-blocks on a planer table and the bar is turned at an angle to the longitudinal axis of the table by an amount which is found through the use of a little "trig."

If R in Fig. 1 is the radius of the O.D. of the bar, and r is the radius of the desired center cross-section, both of which are known in advance, then Sine $\Theta = \frac{r}{R}$. After angle Θ is found the distance X can be calculated by using the expression: Cosine $\Theta = \frac{X}{R}$. It is this distance X that is used to set the bar at the correct angle for the trace to be planed.

One way to set the bar at the correct angle is to scribe line AB on the surface of the bar and parallel to the axis of the bar. Then the distance 2X is set on a caliper and is marked on the edge of the bar at C. Now points B and C are lined up (Fig. 2) so they are on a line parallel to the axis of the table, and also so that points A and B are at an equal height from the planer table. Successive cuts along line BC with a sharp pointed tool will form a groove which has its center tangent to the prospective center circumference of the hourglass shape and its extremes on the O.D. of the bar (Fig. 3).

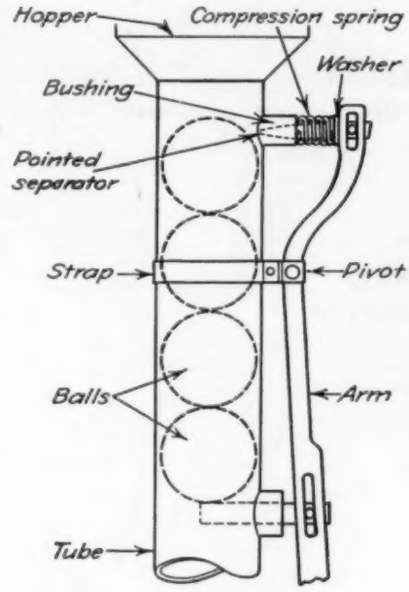
After the trace has been cut, the bar is again mounted in the lathe and the bar is turned down to the trace. Painting the groove with a coloring material will improve the accuracy of the final cut. *Ralph Egolf, Youngstown, Ohio.*



Fixture Winds Special Springs

An unusually long spring that was required was made using this hand-winding fixture. A block which was mounted in a vise was drilled to hold the rod with a slip fit. Another hole, the size of the wire of which the spring was wound, was drilled at a slant in the block to pilot the wire as it wound around the rod.

The simplicity of this design allows it to be made on the spur of the moment, with little cost, to fit any unusual job. The only dimensions that must be changed are the diameters of the two drilled holes and the thickness of the rod. *James F. Bolton, Greenwood, R. I.*

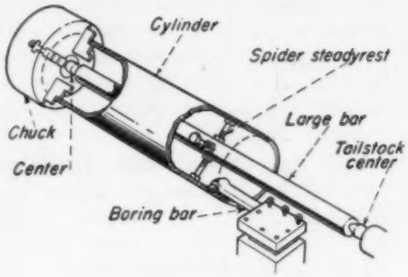


Attached Mechanism Loads Balls In Predetermined Lot Numbers

A simple device for loading a predetermined number of balls can be built into a vertical feeding tube, as shown in the illustration.

An arm, actuated by hand or a mechanical device, reciprocates back and forth on a pivot strapped to the tube. Two stops, located so that the distance between them is equal to the combined diameters of the balls required, alternately hold and release the balls. The upper stop is pointed so that it will enter between two adjacent balls. Bushings are welded to the tube to hold the stops in position when they are extended out of the tube, and a compression spring is located on the upper stop link to keep the lower stop extended into the tube in rest position.

As the balls feed down from the hopper above, the lower stop is retracted and the upper arm inserted, thus trapping and releasing the required number of balls. After the balls have dropped the arm is released and the lower stop re-enters the tube. *Joe Manuiss, New York, N. Y.*

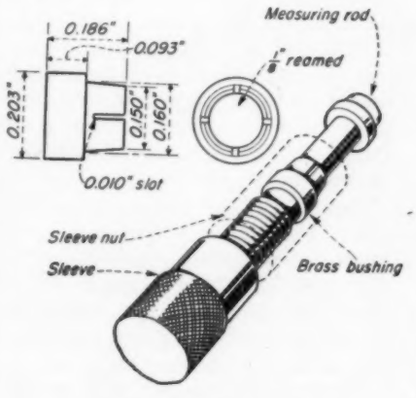


Lathe Spider Supports Cylinder While Counterbore Work is Done

Twelve long cylinders of a diameter larger than the steadyrest of the lathe had to be counterbored. Supported only by the chucking jaws, the job was unsafe and would have taken too long because a heavy cut could not be taken.

By leaving the headstock center in place and centering a bar with four tapped holes near the tailstock between the headstock and tailstock centers, a spider was made to support the cylinders near the end where the machining was to take place. The spider was made of four long bolts, which were screwed into the bar, and then backed out to hold the cylinder.

The resulting setup was strong enough to allow a heavy cut to be taken on the cylinder. *Robert J. Lemp, Woodhaven, N. Y.*



Gage Measures Deep Holes With Replaceable Rods

In order to measure the depth of holes smaller in diameter than the measuring rod of a depth micrometer it is necessary to either purchase special rods or to machine the original one. This can be avoided by a simple change in the barrel of the gage.

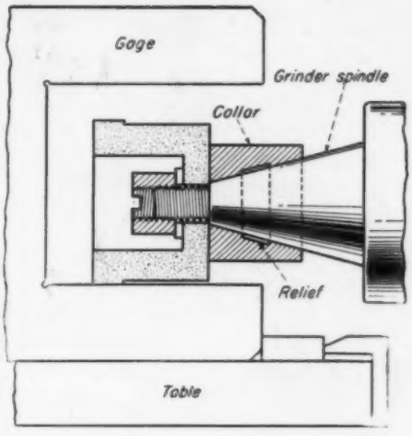
A brass bushing is turned to the dimensions shown in the illustration, and the micrometer sleeve nut is drilled through the end with a No. 24 drill concentric with the inside surface. This hole can also be reamed about 0.003 in. larger with a tapered reamer, from the inside, for best results.

The gage is assembled with a new rod, which has been ground to the necessary shape, mounted with the collar inside the micrometer sleeve nut. The collar provides a clamping action that will hold the rod in any location positively.

The new rod can be set when the micrometer adjustment is set at zero, and measuring can now take place. The gage will now take any number of special rods, and will also work with the original rod just as before. *Edward Diskavich, Torrington, Conn.*

Cup Wheel Surfaces Snap Gages By Getting Inside Deep Throat

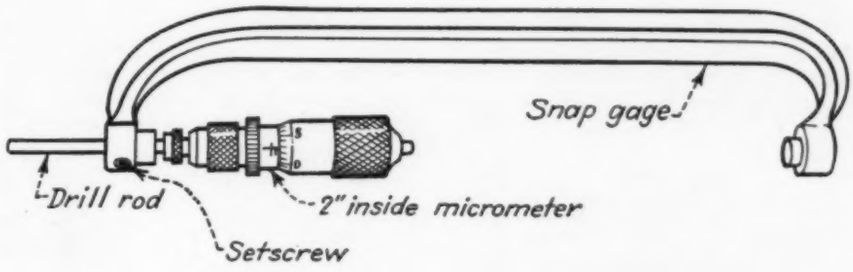
In order to be able to get into the deep throat of a snap gage it was necessary to find some means other than common practice to mount a small cup grinding wheel. A collar



with a tapered I.D. to fit the surface grinder spindle did the job.

The collar was relieved to guarantee a good fit, and was machined so its outer edge was even with the end of the threaded portion of the spindle. A washer and spindle nut held it in place.

The arrangement was found to be useful for covering the range of grinding-wheel sizes between the regular surface grinding wheels and the very small wheels of the high-speed attachment. *Ed. Babin, Lynn, Mass.*



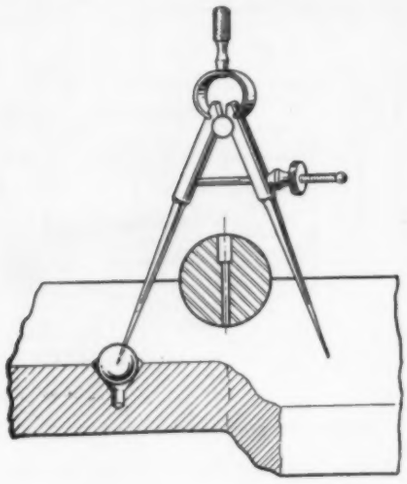
Makeshift Micrometer for Large Work Is Built from Discarded Snap Gage

Recently we had a job which required the accurate measurement of two large dimensions — 15.500 and 12.250 in. Both had to be held within 0.002 in., but we had no outside micrometer caliper this large. Luckily, we did have an old 17¼-in. snap gage which we made into a micrometer to fit the circumstances.

First we drilled and reamed a ¼-in. hole lengthwise in one anvil. Then we drilled a hole for a 3/16-in. setscrew perpendicular to this first hole and intersecting it. Finally a piece of ¼-in. drill rod was turned to fit the barrel of a 2-in. inside micrometer.

With the micrometer mounted on the drill rod and the drill rod set in the hole in the anvil, the micrometer could be used to take the desired readings by holding the drill rod in position with the setscrew.

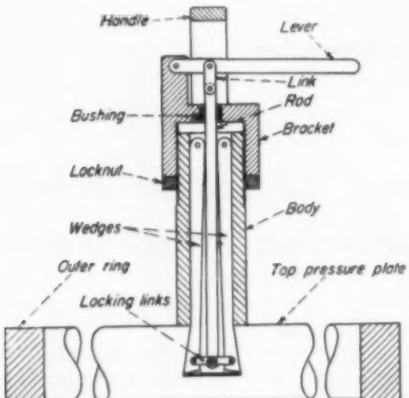
The micrometer was set by using an inside micrometer between the snap gage anvil and the micrometer anvil. This makeshift micrometer provided good results, and could also be used for other dimensions later. *George Werner, Newark, N. J.*



Dividers Make Layout From Hole As Bearing Ball Locates Center

A simple method of laying out from a drilled or centerdrilled hole is to make up a set of balls of various sizes that can be fitted onto the end of one leg of a pair of dividers. The balls—those from old ball bearings are ideal—are annealed and a hole is drilled in each to take the divider point.

For the best bearing surface a tapered reamer can be used, but a small drilled hole, followed partially through by a larger drilled hole, as in the illustrated detail, will provide a two-point bearing surface. *Norman Ingalls, Flint, Mich.*

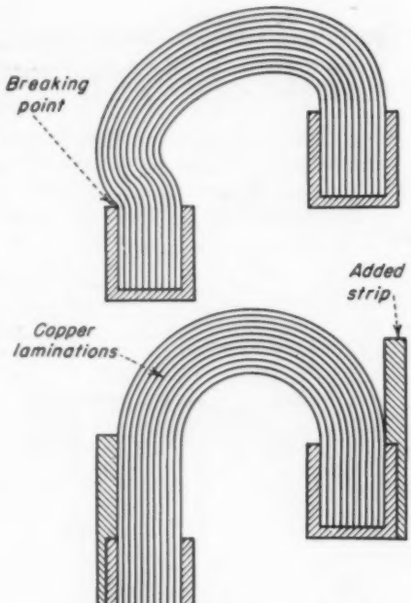


Mold Plate Gripped for Lifting By Internal Wedging of Clamp

After a part had been formed in a mold under pressure it was necessary to lift out the top pressure plate and outer ring of the mold to remove the part. Since the top pressure plate made contact with the ram of the press, it was impossible to use a permanent fixture.

The use of a bolt in a tapped hole was eliminated, because of the time that would have been lost in screwing and unscrewing, by using a quick-acting internal clamp. The hole drilled in the top plate was bored to have the shape of a truncated cone. Action of the linkage expands the two wedge-shaped bars to grip the sides of the hole. The wedges are expanded by downward pressure on the lever and released by a pull.

To clamp the device for lifting the fixture is positioned over the hole with the lever up, and then pushed into the hole. The handle allows the lifting of a heavy pressure plate. *F. G. Forquer, Buffalo, N. Y.*

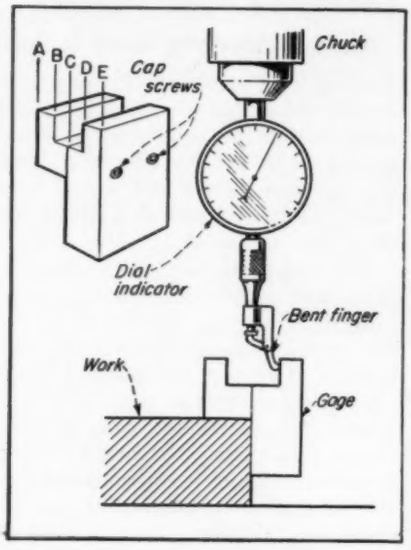


Guard Strengthens Welder Shunt

In spotwelders using a movable electrode the connection from the transformer secondary to the movable electrode is made by means of a laminated shunt, which is composed of many thin strips of copper. The ends of the strips are clamped together by a U-shaped piece of copper and are sweated to make a solid terminal.

These shunts eventually fail at a point just above the edge of the copper clamp because of the bending back and forth during operation. The rate of replacement can be considerably reduced if an extension strip is added to each outer side of the shunt. In new installations the original clamps can be replaced by longer substitutes which can be sweated in place.

This change will make the laminated strips last the life of the machine, and will not hamper in any way the action of the shunt. *Gordon A. Ream, Garden City, Mich.*

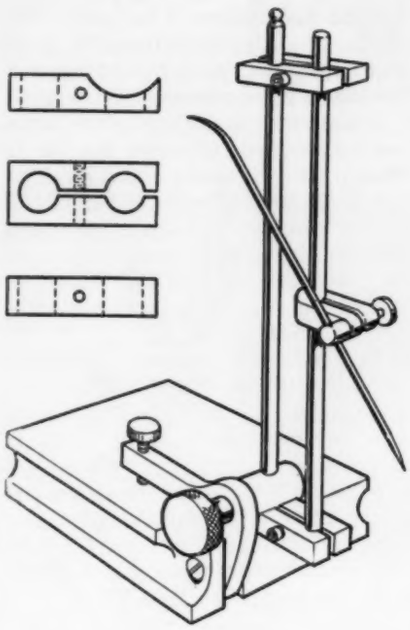


Block Gage Centers Jig Borer Over Work Edge to Locate Holes

Finding the edge of a workpiece set up in a jig borer has always been a delicate job. This gage for locating the spindle of a jig borer over the work edge precisely is an improvement on the one by Roger Isetts published in AMERICAN MACHINIST some time ago.

Two blocks are made with parallel faces. For effective operation of the gage, shown in the upper detail, the distances from *B* to *C* and from *C* to *D* must be identical. The easiest way to insure this is to grind the blocks flat on their backs, grinding the surfaces *B* and *D* together, and the surfaces *C* on both blocks together.

After completion, the gage is used as shown in the lower detail. A dial indicator mounted in the chuck of the boring machine is located so as to touch both sides of the gage as it is rotated by hand. The spindle of the machine can be moved back and forth until the peak readings of the indicator on both sides of the gage are the same. *Chris Sorenson, Racine, Wis.*



Double Spindle Strengthens Gage For Use With Large Layout Work

The substitution of a 24-in. length of drill rod for the standard 18-in. spindle on a universal surface gage will allow the gage to be used for larger layout work, but the additional length will cause some flexure and inaccuracy. This can be overcome by adding a second length of drill rod to stiffen the gage.

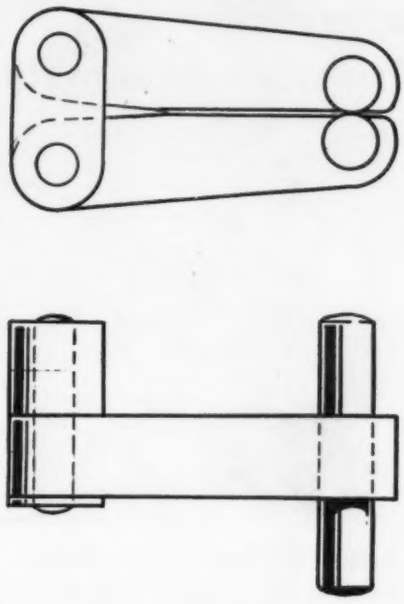
Two brackets, as shown in the drawing, are machined, and ⅜-in. holes and slots are made. The brackets are also tapped for 3/16-in. Allen-head screws for tightening. The lower bracket is mounted by pushing a rod through the rotating head and into the hole in the bracket. The second rod is mounted and both brackets are tightened.

The double spindle will now allow layout work to be done without flexure of the spindle. *Charles H. Marsteller, Brooklawn, N. J.*

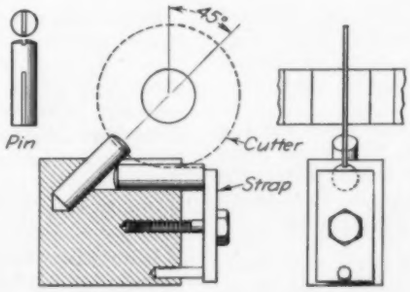
Pin Gage Aids Tube Measurement By Holding Dimension for Check

Instead of buying a special micrometer caliper with a rounded anvil for measuring the thickness of tubing, we made this simple gage that fits inside the end of a tube and could be used with a standard micrometer.

The hardened points of the gage are made of drill rod, and are pressfitted into their holes in the two milled bars. One of the joining pins is driven through the bar and link, and is riveted over on both ends. The other pin is a working fit in the link, and is driven into the bar and riveted over.



The two contact points are of a known size — in the original they were 0.1875 in. in diameter. This fact allows the reading to be taken with the micrometer caliper and the thickness of the tube to be calculated by subtracting 0.375 in. from the reading. Tubing from about 3/16-in. diameter up can be measured accurately. *Martin H. Ball, Watervliet, N. Y.*

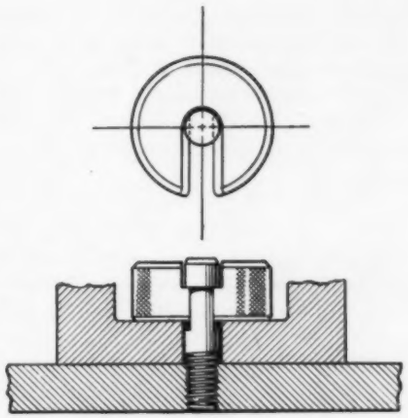


Fixture Holds Pins For Milling

In order to shorten the time required for milling two slots of equal width in a production job of brass pins, an inexpensive milling fixture was designed to permit the machining of both the screwdriver and keyway-type slots at once.

The steel fixture, which was held to the machine table in a vise, was drilled to take the two pins, as shown, with a slip fit. The horizontal pin was forced against the inclined one by the clamping action of a strap, which was positioned by a pin in the block which fitted in a centerdrilled hole in the strap. Both the depth of the inclined cut and the length of the horizontal cut were controlled by stops on the milling-machine table.

After operations had begun, the sequence was to insert a pin which had been longitudinally slotted into the inclined hole, and to place a new pin in the horizontal hole. A few turns on the strap bolt tightened the fixture for milling. *H. Moore, Kirkstall, Leeds, England.*

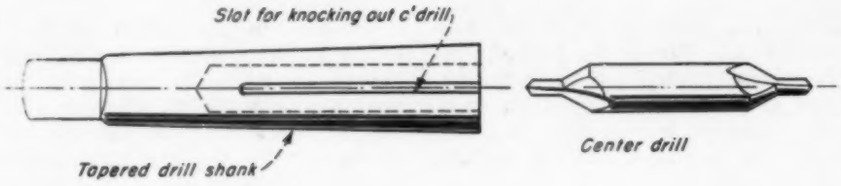


Washer Holds Stud in Small Hole

For light tightening operations where it is impossible to get a wrench into a hole in a workpiece to tighten down a hexagonal stud head, or where a wing nut will not fit, this knurled washer will provide a means of fastening a part to a jig or fixture.

The washer is milled out on one side to form a stepped slot. This slot mates with two flats on the sides of a stud which has had its head removed. The bottom end of the stud fits into a threaded hole in the jig or fixture.

This type of washer is also useful in conjunction with quick-acting clamps where the clamp is permanently fastened to one end of a rod in place of the thread and the other end must clamp in a small hole in a casting or machined part. *James Keating, Rochester, N. Y.*

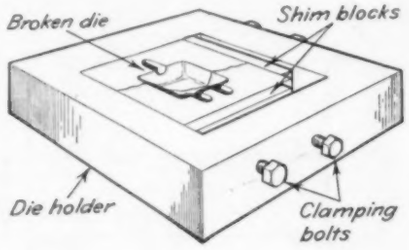


Drill Shank Holds Centerdrill For Rapid Tailstock Assembly

An efficient method of having a drill, centerdrill and reamer rigged for a production job on an engine lathe is to have them mounted in tapered shanks so they can be quickly interchanged in a tailstock shank of the same taper.

Although both reamer and drill, if they do not have tapered shanks, can be held in Jacob chucks, the centerdrill cannot be easily mounted in this fashion. A solution is to anneal an old tapered drill shank, cut it off at the end of the taper, and drill and slot it, as shown, to hold a centerdrill. The fit should be fairly tight.

The use of separate shanks for each tool eliminates excess wear of the ratchet on a chuck, which would otherwise be used. Besides the saving in wear, the convenience and speed of this arrangement overcome the objections to using a number of the tapered shanks. *Allen B. Nixon, Springfield, Mass.*



Broken Die Supported in Block Makes Replacement Unnecessary

Die breakage can be attributed to a number of causes, all of which are difficult to avoid unless extreme care is taken in the design, fabrication and installation of the dies. The results of sloppy heat-treating, careless machining, poor bolstering and the like are expensive replacements.

Sometimes, though, replacements can be avoided, provided the die is broken with clean edges and no chips are made in the break. A large die holder can be made of tough steel to hold the broken parts of the die in place and will allow continued use of the die, even though it is in two or more parts.

The holder is machined to carry the die with two shimming blocks as illustrated. Clamping bolts can be turned down in threaded holes in the block to make the pieces immovable. This sort of repair job has been used with favorable results, and has saved great expense by making replacements unnecessary. *Fredrico Strasser, Santiago, Chile.*

Removing Bushings in Blind Holes

A good system of removing a tight bushing from a blind hole is to pour heavy oil in the hole and fit a plug into the bushing. A few taps with a hammer on the plug will be sufficient to force the bushing out with the hydraulic pressure. *Hans Schmidbauer, Goggingen b. Augsburg, Germany.*

NOW... $25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

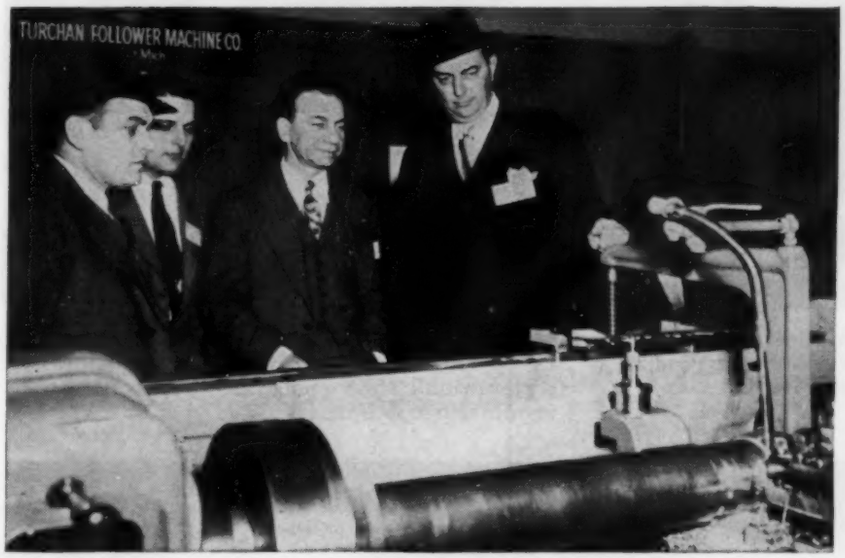
Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Forty-eighth Selection — William F. Hoag's Gear Changing Calculations

NEWS OF METALWORKING



Examining the new Turchan follower for contour turning on a lathe are, J. S. Steiner, shop mgr., Landis Tool; P. Aubrey, Cosa Corp.; M. Turchan, Turchan Follower Machine Co., and M. A. Hollengreen, president, Landis Tool.

Sales, Inquiries Reach Record Number at Tool Engineers' Show

CLEVELAND—Largest and best attended of its kind, the Tool Engineers' Industrial Exposition attracted over 63,000 visitors to the Municipal Auditorium March 15-19.

More than 300 exhibitors displayed a wide variety of products ranging from machine tools to cutters and gaging equipment, many of which were shown for the first time. Interest was extremely keen, and indications are that inquiries and actual sales reached a new high in volume.

A novel feature was the provision of an aerial taxi service to permit potential customers to visit manufacturing plants when demonstrations were required beyond the capacity of the exhibition booths.

Held concurrently with the exposition was the society's 16th annual meeting. This marked a distinct change from previous conventions in that only three technical sessions were held. These took place in the Hotel Cleveland during the evening to avoid conflicting with the show.

Public Attends Show

Exhibitors reported that demands for new products was exceedingly great and that in many cases deliveries were far in the future. The public was as interested in the show as the technical visitors, and swarmed in daily. The reduction in the number of technical sessions gave visiting engineers, production men and executives more time to see the equipment.

The first paper was presented by Allan H. Mogensen, industrial consultant, and dealt with work handling simplification; the second session featured N. E. Rotenthaler, Ford Motor Co., in a discussion on dies and the control of deep draws and irregular shapes. A Tool Engineers' Quiz formed the third session. In this, a panel of experts from various branches of industry answered a series of prepared questions embracing a wide range of tool engineering problems. Numerous unscheduled questions were also asked from the floor, and some lively discussion provoked.

High spot of the convention was the annual banquet at which James D. Mooney, president and board chairman of Willys-Overland Motors, spoke. Warning that Russia is the only real threat to world peace, he urged that the United States drop the use of ideological terms and deal with the international situation in terms of practical power policies. The road to peace, he pointed out, lay in maintaining our own production and military strength, in assisting Britain to reconstruct her civilian and military resources, in working with the British to re-establish France as a leader of the Western powers, and working with both these countries to re-establish German production for the benefit of the western powers.

New national officers elected during the convention were installed with appropriate ceremonies at the banquet, and included Irwin F. Holland, president; R. B. Douglas, 1st vice-president; H. L. Tigges, 2nd vice-president; and V. H. Ericson, 3rd vice-president.

Show Highlights

Among the most attention-arresting exhibits was the Lees-Bradner demonstration of the Cri-Dan threading machine. Developed in France and perfected in England, this machine is being placed on the American market by Lees-Bradner with American motors, controls, tools and equipment. Using a single-point carbide tool, the machine cuts internal or external threads at extremely high speeds and to a high degree of finish and precision.

Of particular interest was Eastman Kodak's entry into the industrial field with a line of precision gear checking machines, known as the Conju-Gage, and an optical comparator employing high-intensity illumination to permit its use without the usual hood or curtain.

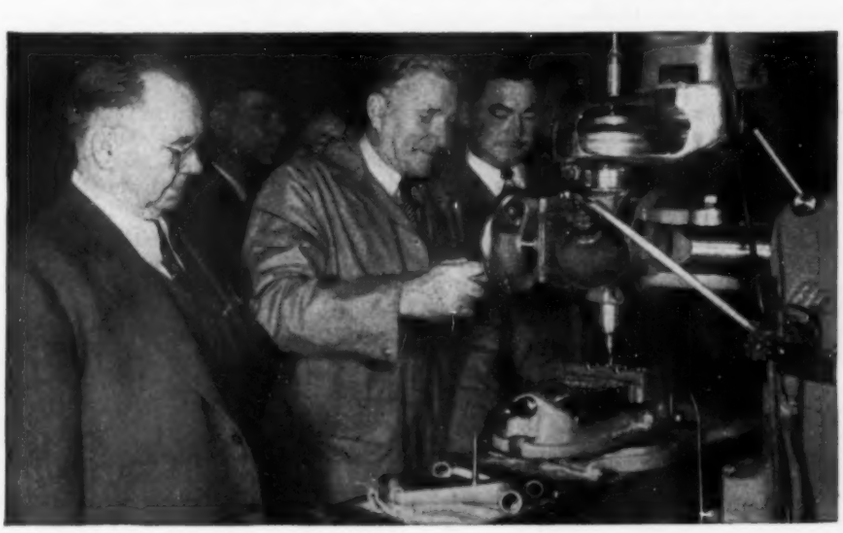
Brown & Sharpe introduced a full line of end mills and a height indicating attachment for use with their electronic gage, so sensitive that it responds to fractional ounce pressures.

John Sylvester, Boston district sales mgr., Small Tool and Gage Div., Pratt & Whitney, Div., Niles-Bement-Pond, and James H. King, gen. sup't, Reed Prentice Corp., examine Carboloy die sets.

Melvin H. Emrick, president, Ettco Tool, explains the operation of his new multiple-spindle, adjustable-center drilling and tapping head to H. J. Boll, American Machine & Foundry Co.

Mason Britton, president, Metal Cutting Tools Institute, discusses with Paul Polk, gen. mgr., Threadwell Tap & Die Co., a new line of Threadwell fixed gages.

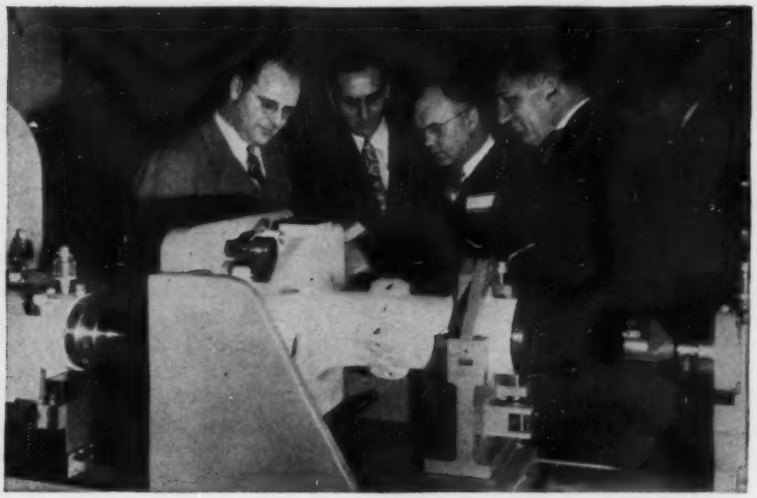
H. T. Stillwell, Sentinel (Shrewsbury) Ltd., England, and J. A. Bradner, president, Lees-Bradner Co., talk over Lees-Bradner's new Cri-Dan high speed threading machine with H. T. Johnson, process development, General Motors.



Rudolph Bannow, president, Bridgeport Machines, in shop coat, demonstrates his new cherrying milling head to R. A. Whaling, president, P. M. S. Co.; Wm. Leslie, Cove Pattern Works, and C. H. Clover, National Sales Engineering Corp.

INDUSTRIAL EXPOSITION AT CLEVLAND:

E. J. Ulm, foreman, Lima Hamilton Corp. watches L. D. Martin, gear engineer, Eastman Kodak, as he explains the operation of Eastman's new Conju-Gage gear checking machine.



Stokerunit precision boring machine gets attention from P. O. Wernicke, vice-president and chief engineer, Stokerunit Corp.; Joe de Windt, ass't mgr., Allis Chalmers, Norwood; H. L. Vandenberg, sup't of maintenance, Allis Chalmers, Norwood; and L. J. Radermacher, president, Stokerunit.

Geo. A. Highberg, president and treasurer, Whiton Machine Co., demonstrates the high production capacity of a new milling machine to A. R. Williams of A. R. Williams Machinery Co.

Moore Special Tool Co.'s die flipper for simplifying final die assembly is explained to A. L. Becker, ass't supervisor, tool engineering, I.B.M. by R. F. Moore, president, Moore Special Tool Co.

Charles M. Pond, second from left, vice president and manager, Small Tool and Gage Dep'ts, Pratt & Whitney, Div. Niles-Bement-Pond Co. discusses the wide range of precision measuring instruments offered by his company.

Research Results Impress Members At Fourth Magnesium Assn. Meeting

NEW YORK—Developments in magnesium processing, applications, and alloys were the highlights of the Fourth Annual Meeting of The Magnesium Association here March 18 and 19.

Exhibits at the Pennsylvania Hotel ranging from 4-oz. binoculars to an Army dump-truck body of 5 cu. yd. capacity attracted interest. It was noted that there were far more items exhibited, and many more of them represented current applications, than in previous exhibitions.

W. S. Loose of Dow Chemical Co. told of research that has developed to the point of commercial application. In addition to the electroplating process (see box), his talk summarized many developments in welding procedure which have taken place since the war and described the brazing process, mentioned at a previous meeting.

New Alloys Revealed

A brief look at the secret research that has been going on in new alloys was given by Lt. Gen. R. A. Wheeler, Chief of Engineers. He revealed that alloys in the laboratory stage have reached compressive and tensile yield strengths of 74,000 psi. These alloys have a specific gravity of 1.5 (about 12% less than present alloys) and considerably improved fabrication properties. During rolling they can be reduced 66% in one pass, as compared with 10% for present alloys, and they can be cold worked. They do not yet retain their stability in desert terrain, but Gen. Wheeler indicated that this problem should be solved "to our complete satisfaction."

Charles Nelson, research director at Dow, emphasized in a private interview that these new alloys are not yet ready for commercial use, and that it is likely to be several years before they are available at a price that will permit commercial applications.

Arctic Uses Cited

Arctic operations at temperatures down to —75° F. were described by J. W. Millard. research director, Mechanical Section, Research & Development Branch, Quartermaster Corps. Many materials, such as wood, rubber, tool steel, many plastics, and cloth lose many of their normal properties at such temperatures, he said. The fact that magnesium retains its properties at such temperatures plus its weight advantage makes this metal most important in developing equipment for Arctic operations.

The weight saving is important, too, in airborne equipment. An example is a trailer redesigned from 1700 lb. in steel to 600 lb. in magnesium. Space required in transit has been reduced 50% by torsion-mounted retractable wheels.

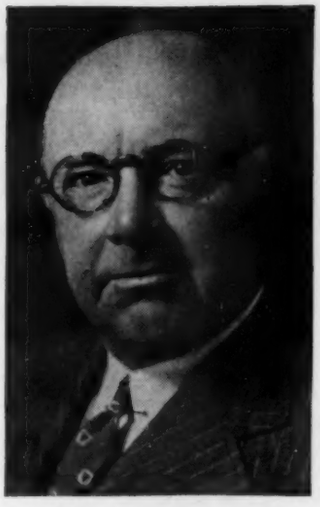
Printing Process Described

The Higgins printing process was described by W. J. Higgins, president of William J. Higgins Corp. Copy typed on justifying typewriters and illustrations are pasted into full-page layouts which are photographed and engraved on magnesium plates. These plates can be used directly on flat-bed presses or curved and mounted on rotary presses without the need for making mats and lead castings. In a 20-page newspaper, a ton of molten metal is required by conventional methods, but only 100 lb. of magnesium is needed in the Higgins process. When chrome-plated, the magnesium plates have run over 6 million impressions. Although the method works with existing presses, its widespread use would permit the design and construction of much lighter presses.

Officers of The Magnesium Association elected at the meeting included George W. Motherwell, vice president of Wyman Gordon Co., as the new president; D. W. Stewart, Jr., of Light Alloys Ltd., as vice president; and Donald Warner, sales manager of Aluminum and Magnesium, Inc., as treasurer.

Dow Plates Magnesium

MIDLAND, MICH.—Rumors that Dow Chemical Co. was at last on the right track in developing a method to electroplate on magnesium have been confirmed by the announcement that the process is ready for commercial use. Dow has had a pilot plant in operation since last fall, has made runs up to 40,000 parts. Key step is a zinc-immersion coating after cleaning which can be followed by conventional plating. H. K. DeLong, who developed the process, will describe it in detail in an article in **American Machinist**, May 6.



CLAYTON R. BURT

Clayton R. Burt Elected Head of Potter & Johnston

WEST HARTFORD, CONN.—Clayton R. Burt has resigned as chairman of the Niles-Bement-Pond Co. to become president of the newly-formed Potter & Johnston Co., which will take over the business of the former Potter & Johnston Machine Co., Pawtucket, R. I. The Potter & Johnston business has been purchased by Niles-Bement-Pond, which will operate it as a subsidiary under Mr. Burt's direction.

It is probable that at a later date Potter & Johnston sales will be combined with the national sales staff of Pratt & Whitney, Division Niles-Bement-Pond Co. The Pawtucket plant and manufacturing equipment will remain under the ownership of the old Potter & Johnston Machine Co., which will be known hereafter as the Darlington Industrial Corp.

J. Earle Makant will continue in charge of the plant operations for the new Potter & Johnston Co., J. Potter Cunningham in charge of sales, and Carl A. G. Birkedal in charge of accounting. On the other hand, Norman R. Earle will be executive vice president of the Darlington Corp. and Jacob Ziskind president and treasurer.

Mr. Burt, a past president of the National Machine Tool Builders' Association, has been a nationally-known figure for many years in the machine tool industry. He has served for 24 years with Niles-Bement-Pond and under his leadership the company expanded and in 1939 moved to its streamlined, "one-roof" plant in Charter Oak Park in West Hartford.

1,000 Agreements Filed In Month With Labor Unit

WASHINGTON — Copies of more than 1,000 collective bargaining agreements were voluntarily submitted to the Bureau of Labor Statistics by employers and labor organizations during February, the Department of Labor announced here.

These agreements cover small and large employers and unions in many manufacturing and nonmanufacturing industries. Most of them were negotiated for a one-year period, although some will continue in effect for a longer time.

Under the Labor-Management Relations Act of 1947, the Bureau of Labor Statistics is specifically directed to "maintain a file of copies of all available collective bargaining agreements and other available agreements and actions thereunder settling or adjusting labor disputes."

The law also provides that the Bureau's file of agreements (except those submitted in confidence) be made available for inspection and further authorizes the BLS to supply interested parties with "all available data and factual information which may aid in the settlement of any labor dispute . . ."

The BLS has for years maintained an extensive file of collective bargaining agreements for which detailed analyses have been made of various types of agreement provisions, such as union security, overtime and holiday pay practices, and grievance procedures. Special studies or analyses are also made from time to time as a service to unions, employers, Government agencies and arbitrators.

A limited number of mimeographed copies of the monthly listing of agreements *received* will be available for distribution upon request to the Bureau. The actual agreements may be inspected by interested parties in accordance with the following ruling by the Secretary of Labor, published in the Aug. 22, 1947 issue of the *Federal Register*:

"Requests to examine copies of available collective bargaining agreements and other available agreements and actions thereunder settling or adjusting labor disputes, maintained by the Department pursuant to Section 211(a) of the Labor-Management Relations Act, 1947, may be made orally or in writing to the Chief, Industrial Relations Branch, Bureau of Labor Statistics, United States Department of Labor, Washington 25, D. C. The inspection may be made only during business hours at the United States Department of Labor, Washington, D. C. and such inspection will be denied with respect to any specific information submitted to the Department in confidence."

To Our Readers

Unsettled relations between printers with whom we deal and certain of their employees have forced us to use some substitute methods in producing this issue. The results of these deviations from normal may be visible to you. If the printing emergency persists, we may have to resort to still more apparent substitutes. But we intend to let nothing which we can now foresee **stop us from** bringing to you full-length, clear and typographically pleasing issues.

New Standards Unit Organized

NEW YORK—A new professional organization, the Standards Engineers Society, was formally launched at a meeting here on Feb. 25. Open to standards engineers and others interested in standardization, the society is designed as a forum for the interchange of ideas and discussion of problems arising from the development and application of standards in all branches of industry.

The present enrollment includes members of fourteen industrial firms and professional and trade organizations in divergent fields of industry. Stanley Zwerling, of ANEESA, Fort Monmouth, N. J., was elected temporary president of the organization, and H. R. Terhune, of RCA Victor Division, Camden, N. J., temporary secretary-treasurer.

Harold P. Westman introduced the speaker, L. D. Price, manager of the engineering department of NEMA, who discussed the relationship between national, industry and company standards.

Actually a year old, the society has functioned informally as the Standards Engineers Club since February, 1947.

Australia Sells 30,000 Surplus Machine Tools

MELBOURNE—The Commonwealth Disposals Commission, Australia's WAA, has so far realized more than $33-million from the sale of nearly 30,000 machine tools which had been employed in munitions factories during the war. Next to motor vehicles and textiles this represents the largest single item in disposal sales aggregating, to date, more then $330-million.

The Department of Munitions acts as agent for the Commission in the disposal of machine tools. About half the number of units offered were taken over by metal-working firms which operated them under hire contracts during the war. The other half went to outside purchasers.

Surplus Machine Tools Now Under Competitive Bids

WASHINGTON — With only about 10% of the total surplus machine tool supply to remain in inventory after completion of the Army-Navy industrial reserve, War Assets Administration has placed all new offerings of machine tools and industrial equipment on a competitive bid basis. This action is effective immediately and is being done to assure complete offering of residual machine tools by June 30, 1948.

Total surplus machine tool inventories consisted of more than 200,000 tools which cost the government more than $1 billion, but there now remain only about 64,000 tools with an acquisition cost of approximately $228 million. The Joint Army and Navy Machine Tool Committee will acquire for the national stockpile approximately two-thirds of these tools, leaving a residual of about 20,000 tools.

Present sales of individual tools at fixed prices ended April 4. New offerings of machine tools will be on a competitive bid basis after tools are screened by the Joint Army and Navy Machine Tool Committee for the national stockpile.

The tools to be disposed of by this method of sale are generally in O-4 condition or lower—special and single purpose type and standard machine tools more than 10 years old.

Tools selected by JANMAT and released to users will bear a new price schedule. If tools are not purchased at the new prices, they will be returned to the national stockpile.

The new price schedule is as follows:

N-1—90% of acquisition cost; N-2—85% of acquisition cost; N-3 and/or O-1—80% of acquisition; O-2—70% of acquisition cost; O-3—60% of acquisition cost.

Machine tools will first be offered on a competitive bid basis as individual tools with a 30-day inspection period. Any residue from the first sale will be lotted with other residual tools and sold on a tonnage basis.

During initial offerings, priority rights will be recognized on individual tools. Residuals will then be disposed of in lots to all classes of buyers.

Sell "Front Office" Value of New Machine Tools, Distributors Urged

LOS ANGELES—A plea for better selling of machine tools, including selling the "front office" on the value of investment in profit-making machines as recommended by shop officials.

Recommendation of revisions in the federal tax laws which will encourage rather than discourage purchases of new machinery.

A report on plans for a "refresher" sales course and on a forum for discussion of selling techniques.

These were the highlights of the 24th spring meeting of the American Machine Tool Distributors' Association at the Biltmore Hotel March 15-16. It was the association's first meeting on the Pacific Coast. D. N. Macconel, president Machinery Sales Co., Los Angeles, association president, presided at all sessions.

Depreciation Policy Opposed

Installation of highly-productive 1948 model machine tools should be stimulated by correcting the government's short-sighted depreciation policy, by changing tax laws to permit companies to use more of their profits for rehabilitation, and by selling the front office," declared A. G. Bryant, president National Machine Tool Builders' Association and vice president Cleereman Machine Co.

Methods of distributing machine tools should be improved, declared Mr. Bryant, so that all industry may have the benefit of the sales engineering service now so well exemplified by many builders and distributors. He also said that the public, industry, labor and government must be made to realize that the way for America to stay sound is to produce more with better machines.

Mr. Bryant raised the question, "With labor and materials costs double prewar levels, with selling costs, overhead and other charges mounting daily, can the machine tool industry keep its prices at only 45% above 'frozen' levels, operate at one-half capacity, and survive?"

Magazine Drive Conducted

He deplored the government policy of compelling manufacturers to depreciate their machine tools over an average of 20 years. He said that one of the great handicaps today is to make those who control the purse strings but are ignorant of production, understand the profit-making potentials of new machine tools. For the first time in its history, the NMTBA is conducting a magazine advertising campaign directed to those who control budgets.

Discussing the effect of tax policy on the machine tool industry, Tell Berna, general manager National Machine Tool Builders' Association, said that machine tool distributors should draw the attention of their customers to the essential facts of capital recovery and its effect upon replacement of obsolete equipment. He pointed out that the government's depreciation policy is harmful and out of keeping with the facts of life.

Only large companies with complete fiscal records can hope to battle successfully for a sane depreciation policy for themselves, declared Mr. Berna. The small shop cannot do it; and it is small business which "is staggering under the heaviest burden of inefficiency and low production per manhour." Mr Berna prophesied that constructive action will come only "when American industry as a whole awakens to the deadening effect of Treasury policy on recovery of invested capital." The only sensible policy is for the manufacturer to be allowed to set his own rates, provided he follows a consistent course year by year.

Rise in Costs Cited

Mr. Berna urged companies to set aside a sum, over and above that for recovery of the capital originally expended for a machine tool, for purchase of new capital equipment. That is because cost of replacement today far exceeds the original cost. If companies fail to adopt this policy, they will find themselves some day unable to keep their shops in competitive condition. They literally will have paid out their capital as dividends.

Section 102 of the Treasury Regulations, applying a heavy tax on a firm which does not distribute what seems to the Treasury an adequate part of its earnings in the form of dividends, should be repealed or modified, according to Mr. Berna. In any case, any penalty should be levied only on that portion of the surplus determined to be unreasonable, the burden of proof being on the Treasury Department.

"Real Selling" Stressed

"For our own good, we must get our feet on the ground and do some real selling," stated Robert L. Giebel, chairman of the Association's sales and service committee and president Giebel, Inc., New York City. He advocated a day's forum on selling techniques at the association's fall meeting. Such a forum would serve as a refresher course for all members, supplementing the course for a picked group at Cornell this summer.

Mr. Giebel warned that machine tool builders feel that too many distributors are coasting along on their past reputations. "Their salesmen have lost their drive and the head men are too self-satisfied." The sales and service committee has devised a simplified contract between distributors and builders, embodying suggestions made during the past year. Copies are available in the association's office.

In describing the outlook for oil, Don Gilman, vice president Western Oil & Gas Association, stated that "there has never been a time when there was not enough oil above ground to meet the nation's immediate demands. The emergency arose because the oil wasn't where it was needed. It was a dislocation and transportation problem rather than an actual shortage."

"Rik-Mobile" is three-wheeled, gasoline-powered vehicle designed to supplant rickshaws in Far East. On triangular steel frame, Rik-Mobile has motorcycle-type handlebar steering mechanism, with gas throttle on right hand grip. Clutch and brake are in conventional positions on floorboard. Car has speed of 35 mph and will get approximately 70 miles per gallon. Extremely maneuverable, it has two foward speeds. Removable aluminum and plastic top protects passengers in poor weather. Car will be produced by China Engineering Products Corp., 472 Jackson St., San Francisco.

Detroit

HUDSON CAR STIRS DEBATE ON FRAMELESS AUTO . . . DIE CAST PARTS ALSO DISCUSSED . . . LOWER APRIL PRODUCTION IS SEEN

The future of the frameless automobile—or more properly, an automobile with frame integrated into the body—has been stirred as a conversation topic by the 1948 Hudson, following the prewar pioneering in the field by Lincoln-Zephyr and Nash.

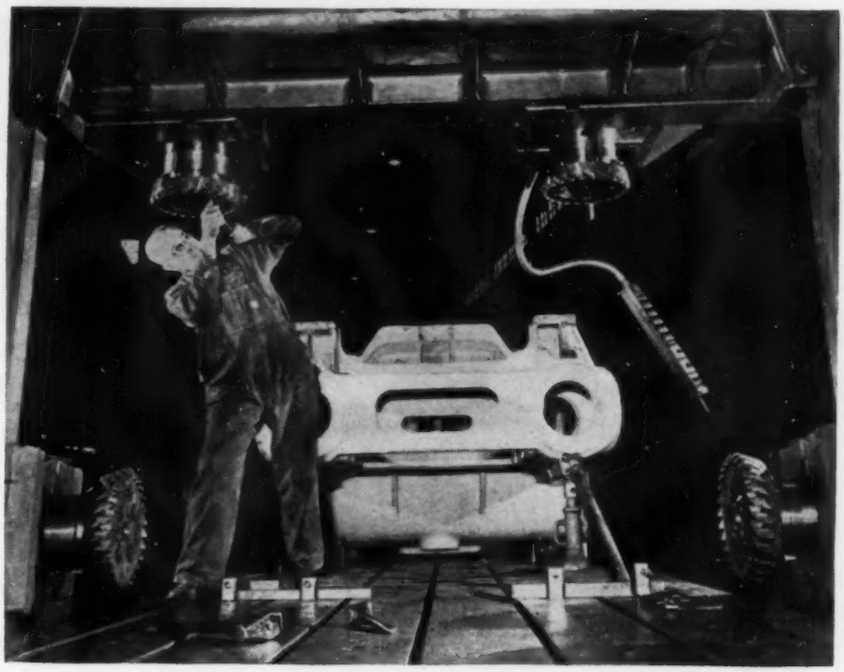
Hudson's concept is more advanced than any which have preceded it. Frame members, made of box-section steel, run both outside and inside the rear wheels, and thread through the entire structure. The result, productwise, is a vehicle which sits lower on the ground without sacrifice of headroom or footroom, thereby offering advantages of handling and safety.

From the manufacturing standpoint, there are no figures as yet as to whether this kind of construction saves or costs money over orthodox car-building. The quantity of steel involved is probably about the same; elimination of heavier box frame sections is balanced by lighter frame members used in more abundance as bases to which the body sections are welded. Naturally, a higher initial tooling cost is involved in the integrated construction. But final figures on input of labor may give integration a definite cost advantage.

Chevrolet Discarded Plans

It is known that the light Chevrolet which was planned for production and then discarded was of integrated construction. But there was never any intention to switch the standard Chevrolet line over to this type of building. The best evidence of this statement lies in the "suspended assembly lines" at the new Chevrolet plants in Flint and Van Nuys, Calif. The monorail conveyors which now carry the chassis through the building operations would be completely useless with an integrated assembly. In fact, one factor which held up final decision on installation of these monorails was whether Chevrolet might change to integrated construction during the amortization period of the new facilities; if policy had tended toward change, the very substantial expense of equipping the plant with monorails would have been passed by.

Up to now, the appeal of the rakishly low type of car made possible by integrated construction was not enough to sway carmakers over to the new method. Nash and Lincoln-Zephyr did achieve successes, true, but not to the extent that the other makers figured they were driven to retooling and revamping their products. Conceivably Hudson might achieve this outcome, but the odds run against it. Until one of the big producers swings to integral building, the industry is unlikely to make a wholesale switch.



Workman adjusts a new machine in the Wilson-Snyder Mfg. Division, Oil Well Supply Co., Braddock, Pa. Employes are tuning up 40 new machine tools at this U. S. Steel subsidiary plant. They now can make 46% more oil country pumps. This is a result of completing their postwar expansion work. Robert E. Zeak is setting a multiple-edge revolving cutter on a giant planer type milling machine. Behind him is an 18,000 pound casting. He will machine it into a gear assembly housing. At the right hangs the push-button keyboard.

But it can be said that all manufacturers are doing some close studying of the entire field; and at least one producer has been interested enough to closely analyze the manufacturing methods of a friendly competitor whose cars are integrated.

Die-cast automobile components have been more talked about lately, following the Kaiser-Frazer report that it was in advanced stages of development on a door to be cast of aluminum. The industry will be intrigued with what finally comes out of Willow Run.

Door Parts Reduced

Trade gossip is that the new K-F door comprises only two pieces, in contrast to upwards of 60 in orthodox stamped-and-assembled units. Obviously, the savings in production would be substantial indeed, if a die casting of the size required can be molded accurately enough to eliminate all machining and to produce perfect fit.

That die castings can be extended lengthwise is indicated by word from Gerity-Michigan Corp., Detroit, that it is now making a zinc alloy moulding strip almost 5½ ft. long, weighing about 2¾ lb. The die for this piece, an auto fender ornament, weighs five tons and is 80 in. long.

Automobile and truck production, having stretched upward to a level of about 23,000 jobs a day during March, slumped off as the month neared its end, due to the start of Ford changeover shutdowns. On this account, industrywide volume was expected to slip to about 100,000 units a week during April. Not until late May, perhaps early June, is there any likelihood of a return to the 115,000-120,000 zone of weekly operations.

A study by the Automotive Tool & Die Mfrs. Ass'n, Detroit shows that the average rate of skilled men now stands at $2.094, against $1.960 last year. The rate for semi-skilled and maintenance men advanced from $1.328 to $1.451 during that period. Notwithstanding, the Auto Union is putting in a demand for blanket 35c wage raises for all Detroit tool shop

Changed Lincoln First '49 Model In Ford Family

DETROIT—The 1949 Lincoln is new from its super balloon 8.20 x 15 tires to the roof of an advanced style body, that is wider, lower and more comfortable.

It has an entirely new V-8 engine of 152 hp, a box section frame, independent front wheel coil spring suspension and Hotchkiss drive through semi-elliptic rear springs. It carries a Borg-Warner automatic over drive, double universal joint propeller shaft and hypoid rear axle gears. Two chassis will be built, one on a 121-in. wheel base and the other on a 125-in. like the 1948 Lincoln.

The front seat is 5 in. wider, the roof 5 in. lower without reducing the head room, the windshield 10 in wider and the passengers sit 4 in. further foward for greater comfort. The trunk is 50% larger in capacity.

Abandoning the unit-body-frame construction as an expediency demanded by the cost of dies and time required to amortize the tools.

V-8 Engine Replaces V-12

The new V-8 engine which replaces the V-12 is 20% more powerful although only 15% greater in displacement. The bore and stroke are 3.50 and 4.375 in. respectively giving a piston displacement of 337 cu. in. The compression ratio is 7.0 to 1. Some of the most important mechanical changes incorporated in the new engine are the arrangement of all the accessories which need periodic attention or adjustment are arranged on top of the engine where they are accessible. A dual down-draft carburetor with an air-cooled float chamber prevents "vapor lock." Exhaust manifolds are on the outside of the cylinder block to lower temperature under the hood. The new crankshaft is a drop forging instead of steel casting. Counterweights are integral. It is drilled so as to conserve the oil by applying it to the low pressure side of the crankpin.

There are separate oil holes in the crank pins for each side by side rod. The valves are of the conventional type, held in place by a detachable spring retainer. The valve guides are not split as in the past and are now pressed into the cylinder block. Hydraulic valve tappets of the "zero lash" type are continued. Strut-type aluminum alloy four-ring pistons are also standard on these engines. A new-type ignition distributor is now used and located on top of the engine.

Diplomas Are Presented by Charles Stilwell, president of Warner & Swasey Co., Cleveland, to two apprentices, Ken Burdick (left) and Ralph Bodenweber (center). The new mechanics were the last W & S apprentices who will graduate for the next three years as the training program was interrupted during the war years. Both men served in the Armed Forces, resuming their apprenticeships immediately after discharge.

Estimated 20,000 Attend Chicago Conference and Production Show

CHICAGO—An estimated 20,000 business and industrial engineers and executives attended the three-day technical Conference and Production Show here March 22-24, fostered by the Chicago Technical Societies Council. More than 150 speakers took part in the 54 technical sessions sponsored by professional and engineering societies affiliated with the council. Conference topics covered a wide field, from atomic energy to heat pumps, jet engines, management problems and cures for the housing shortage.

Climax of the conference was a banquet. Speakers included: Dr. Gustave Egloff, president of Chicago Technical Societies Council and director of research of the Universal Oil Products Co.; F. G. Gurley, president of Atchison, Topeka and Santa Fe Railroad Co.; Commodore Joseph B. Lynch,U.S.N.R., commander, Naval Air Bases, Ninth Naval District; Brig. Gen. S. D. Sturgis, Jr., air engineer, U. S. Army Air Forces; Maj. Gen. E. P. Parker, Jr., U. S. Army, deputy commanding general, Fifth Army; and Leverett S. Lyon, chief executive officer, Chicago Association of Commerce and Industry.

Highlights of the conference included a demonstration of the "lie-detector" by Dr. O. F. Scott, president, National Detection of Deception Laboratories, who described industrial uses of the instrument, and a discussion of the role of metallurgy in atomic energy development by Dr. B. S. Old, chief, Metallurgy and Materials Branch, Division of Research, U. S. Atomic Energy Commission. Recovery, properties, melting and fabrication of Beryllium, Uranium and Thorium were discussed by Dr. H. Wilhelm and Dr. J. Schumar.

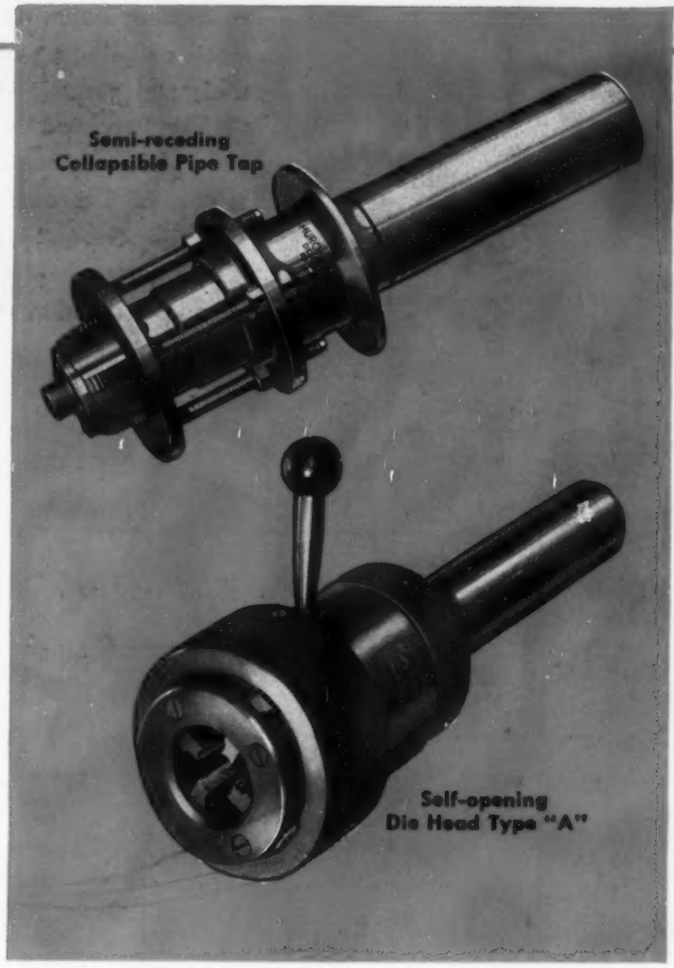
Of special interest to metalworkers were papers dealing with the segregation of industrial scrap presented by M. E. Bornstein of the Flett Organization and E. S. Schwartz of H. Kramer & Co. Mr. Bornstein told his audience that manufacturers take "staggering losses" each year without knowing it because of inefficiency in the disposal of waste materials resulting from their operations. "Sometimes losses in scrap disposal even in the case of companies of moderate size are fantastic," he said. He cited one instance where a plant had been paying $3,000 a month to have its chief waste product—of unusual type—hauled away and dumped. Study of the constituents of this waste product resulted in its sale for an amount equal to the previous disposal cost, an increase in income to the manufacturer of almost $6,000 a month.

The 115 exhibits in the Chicago Production Show, held concurrently with the conference, presented a broad cross-section of industrial activity in the Chicago area. Materials, methods, tools and instruments for a variety of applications were displayed. Of considerable interest was an atomic energy exhibit prepared by the American Chemical Society.

A BETTER, MORE ECONOMICAL METHOD OF THREADING PIPE

The Murchey Pipe Tap

illustrated is a semi-receding, collapsible unit for cutting taper threads from 1¼" to 7" in diameter in cast iron or other materials of similar hardness. Larger sizes are available. For harder materials, the Murchey full receding tap is preferable. Either is used on standard automatic screw machines, drill presses, turret lathes, hand screw machines and special threading machines. These tools can also be arranged to cut straight threads. Both are available in the lever-operated or rotating type.



The Murchey Pipe Die

Types A and C are used for cutting taper pipe threads from ⅛" to 6". Larger sizes are also available. Type A is a stationary pull-off unit for use on machines where the tool is stationary.

Type C is a yoke-operated tool for use on machines which rotate the tool. Excellent production records have been achieved by these tools on a wide range of pipe threading work.

2935

Hope to see you at the ASTE Show, Booth 830

Consult a Murchey Engineer

MURCHEY MACHINE & TOOL CO.
Detroit 26, Mich.

Lowest cost per thread . . .
WITH MURCHEY TOOLS

MURCHEY

Manufacturers of collapsible taps, self-opening die heads (tangent and radial chaser types) and special threading tools

SUBSIDIARY OF THE SHEFFIELD CORP.
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YOU CAN'T AFFORD NOT TO USE STARRETT PRECISION GROUND FLAT STOCK

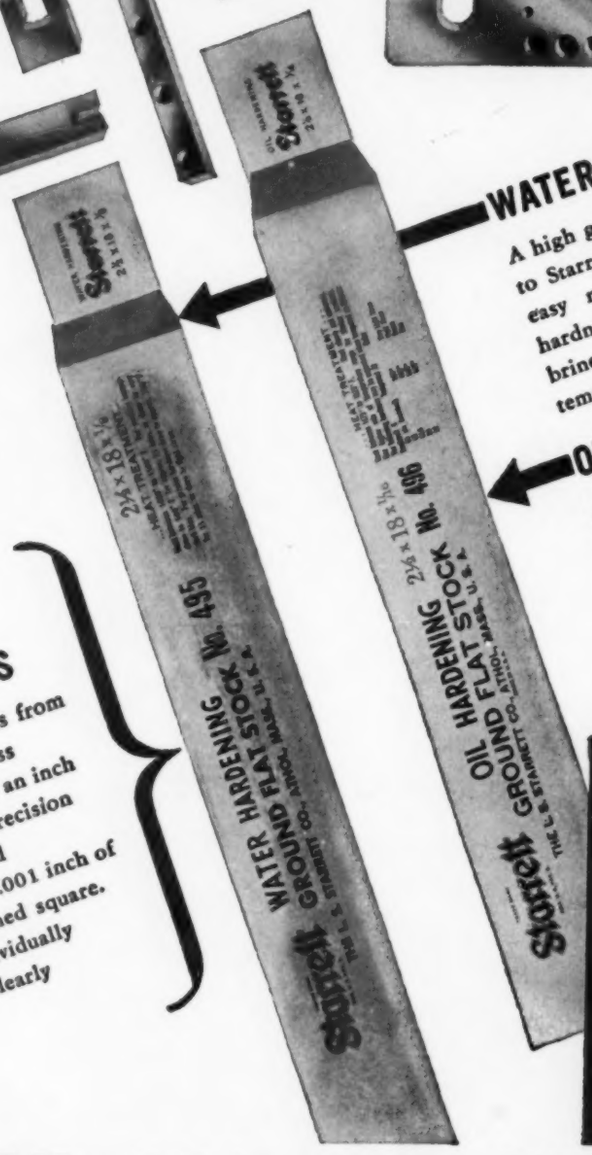
How many hours do your men waste hunting up stock or grinding odd pieces to size for special tools and parts? Plug this source of waste with Starrett Precision Ground Flat Stock. Keep a supply of frequently used sizes in the tool crib or buy it as needed through your mill supply distributor. Write for Ground Flat Stock Folder and Chart "C" which gives complete information, lists sizes, hardening instructions, etc.

WATER HARDENING

A high grade tool steel specially made to Starrett specifications. Annealed for easy machining. Develops maximum hardness when quenched in water or brine and may be drawn to any desired temper in oil.

OIL HARDENING

A non-deforming, electric furnace tool steel, fully spherodized annealed with fine grain structure and deep hardening characteristics. Ideal for precision parts which require accuracy of size after hardening.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18 inch lengths, widths from ½ to 6 inches, thickness from a sixty-fourth to an inch or more. Flat sides precision ground parallel and straight to within .001 inch of size, ends machined square. Each piece individually wrapped and clearly identified.

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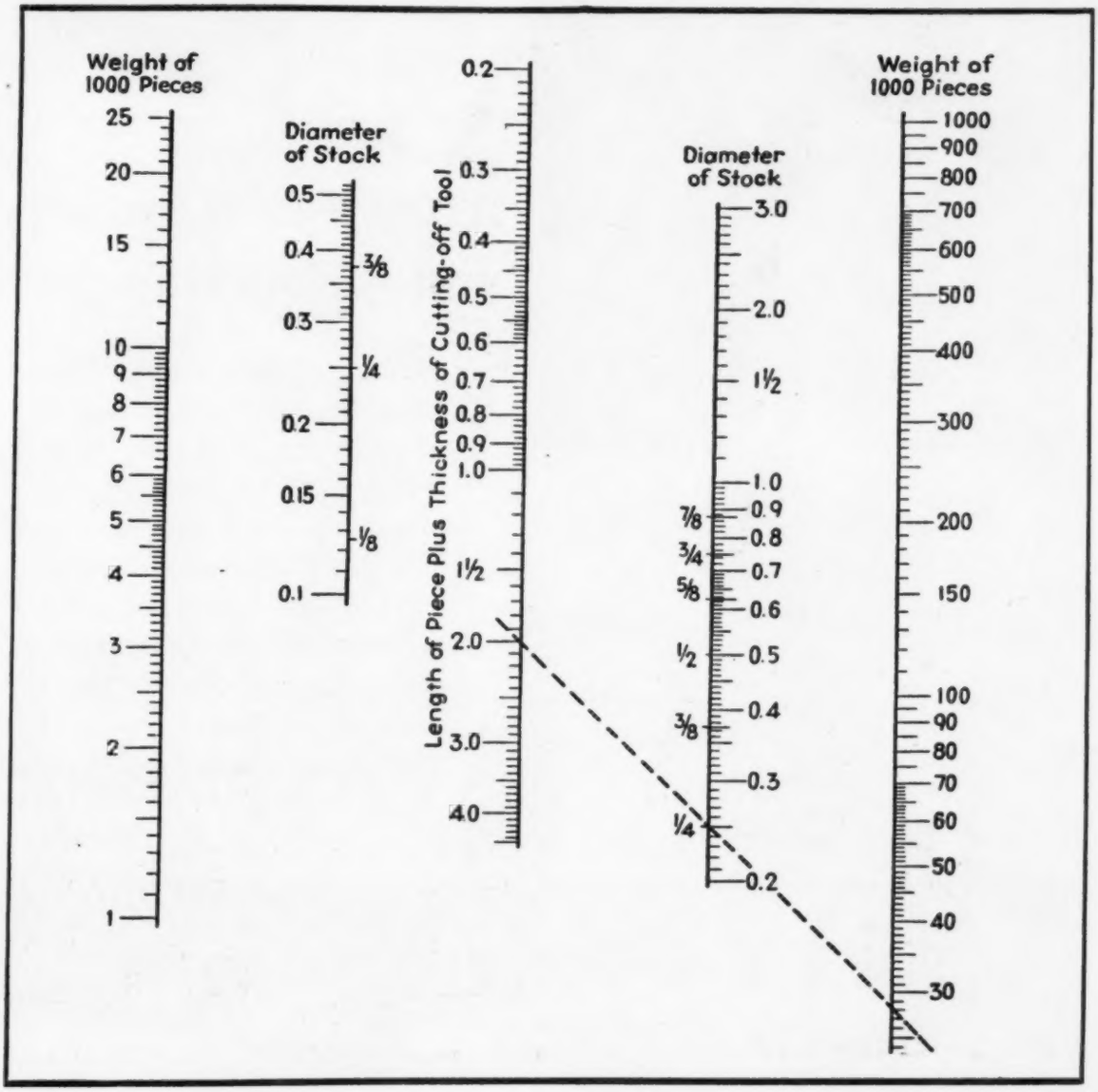
Weight of Steel Bar for 1000 Pieces

Round Steel

THIS CHART is used to determine the weight of round steel bar stock required for 1,000 pieces of known diameter and length within a range of approximately 0.10 in. diameter by 0.20 in. long to 1½ in. diameter by 4 in. long. There are two diameter scales and two weight scales on the chart. Care must be taken that the weight scale is always read on the same side of the chart as the diameter scale.

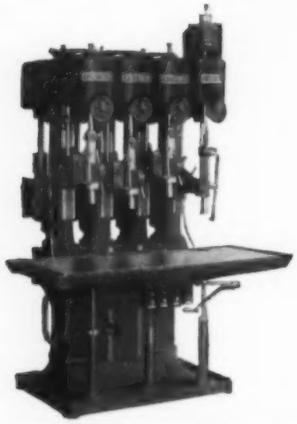
DIRECTIONS—Ascertain the diameter of the stock to be machined and the length of the finished piece; add to the latter the width of the parting tool. Using this diameter and length, draw a line through the diameter and length scales until it intersects the weight scale. The reading on the latter will give the weight of round steel stock necessary to machine 1,000 pieces.

EXAMPLE—The weight of ¼-in. round steel bar stock required for 1,000 pieces 1 15/16 in. long (add 1/16 in. for the width of the parting tool) is 28 lb. according to the right-hand scale.



A FULL RANGE SENSITIVE DRILL FOR PRODUCTION OPERATIONS

For continuous operation Footburt Sensitives have the sturdiness to maintain trouble-free accuracy on long runs. High speeds up to 3450 RPM for small drills on brass and aluminum work, and slow speeds down to 185 RPM for counterboring in tool steels are both available. Power feed and built-in tapping attachments may be added for highest production. Write for full particulars on this full range drilling machine.



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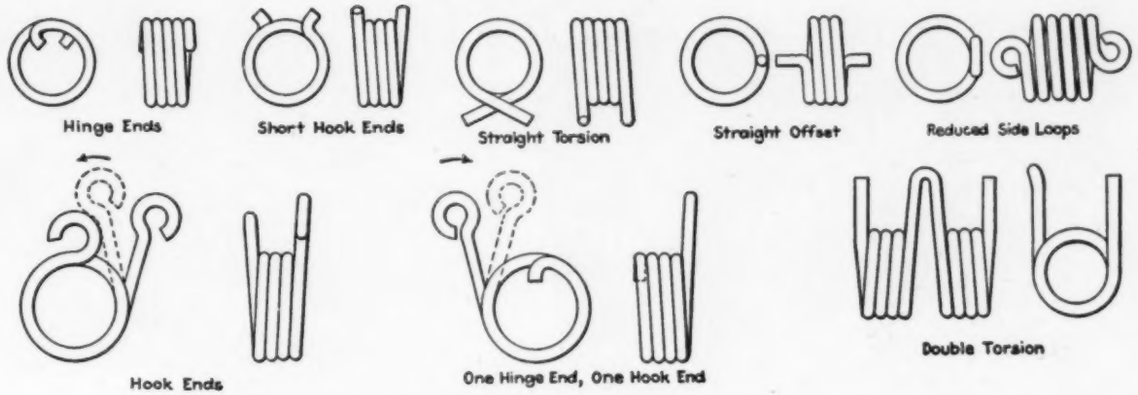
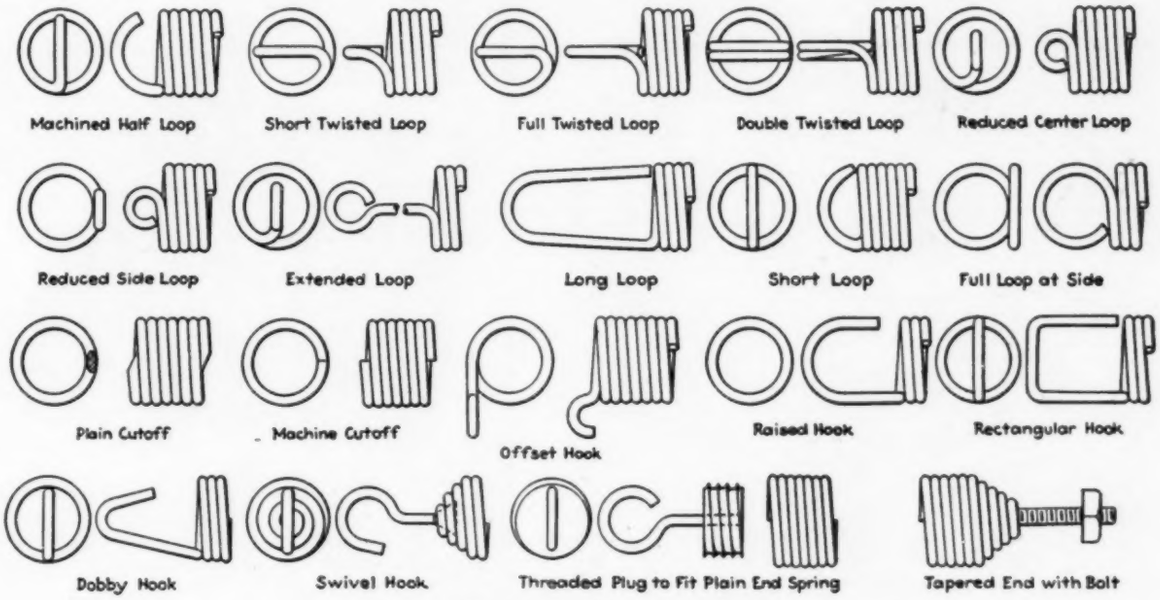
FOOTBURT *Sensitive* **DRILLING MACHINES**

Typical Ends of Commercial Helical Springs

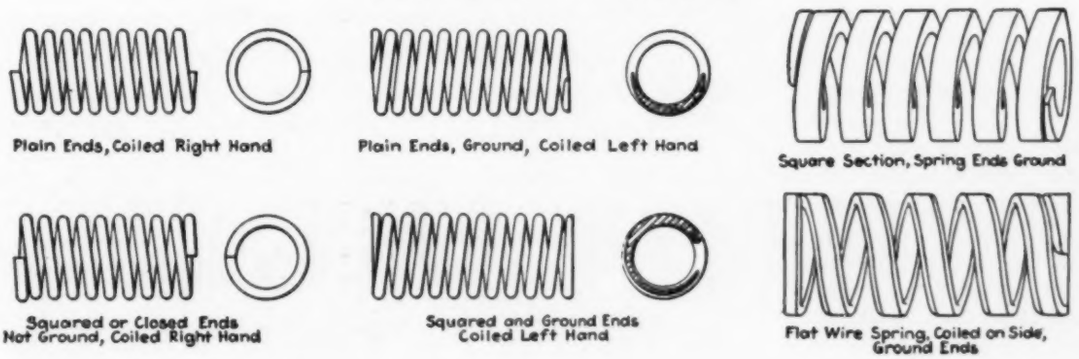
TORSION SPRINGS



EXTENSION SPRINGS



COMPRESSION SPRINGS


Plain Ends, Coiled Right Hand
Plain Ends, Ground, Coiled Left Hand
Square Section, Spring Ends Ground
Squared or Closed Ends
Not Ground, Coiled Right Hand
Squared and Ground Ends
Coiled Left Hand
Flat Wire Spring, Coiled on Side,
Ground Ends

Trouble-saving tips on machining ...by Stainless Sam

1 Bushings should be *short* when you are using a drill jig. This makes it possible to use a short drill. Removable bushings can be used if chip congestion in the bushing is a serious problem.

2 Thinning of the web *at the point* of a drill, by grinding at the spot indicated by Stainless Sam, reduces the bearing area of the drill and makes drilling easier. The shoulder gives the cutting edge greater strength because it is backed up.

3 Stainless Sam recommends a three-cornered punch when you center-punch ARMCO Stainless Steels. Marking the work *lightly* prevents excessive work-hardening of the metal at the mark and provides easier starting of the drill.

4 This drill grind aids in chip disposal. Drills should be backed out at intervals to relieve chip congestion. The general rule for automatic screw machine work is three to four times diameter of drill on first insertion, one to two diameters for second, and three-quarters for the third and fourth.

If you are not using ARMCO Stainless Steel bars or wire, perhaps parts of your equipment or products could benefit by these rustless metals—often at *no increase in cost*. ARMCO Stainless resists heat and corrosion, adds strength and beauty to the products you make.

For complete up-to-the-minute information on drilling and other machining operations, write for a copy of the ARMCO booklet, "Machining of ARMCO Stainless Steels."

And remember, ARMCO Stainless Steel bars, wire and angles are available for quick delivery. Just write The American Rolling Mill Co., 260 Curtis St., Middletown, O. Or call our nearest district office or ARMCO Distributor.

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ARMCO

STAINLESS STEELS

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Methods of Driving Straight-Shank Drills

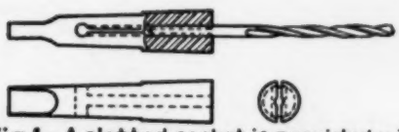

Fig. 1 - A slotted socket is provided with a hole the same diameter as the drill to be used

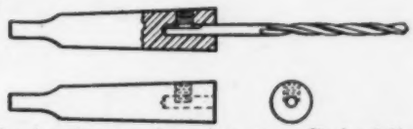

Fig. 2 - A setscrew bearing on a flat at the end of the drill shank does the driving

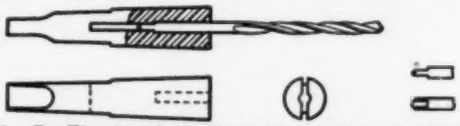

Fig. 3 - The slot is milled deeper than the hole and a flat is milled on the drill shank to engage the slot and do the driving

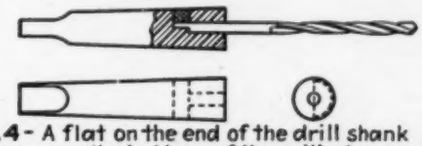

Fig. 4 - A flat on the end of the drill shank bears on the bottom of the milled groove of the socket. The groove is then filled with solder

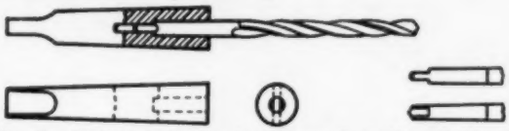

Fig. 5 - A slight taper is ground on the drill shank and flats are milled to suit the slot in the socket

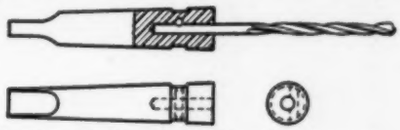

Fig. 6 - The drill is held in place and driven by the pin

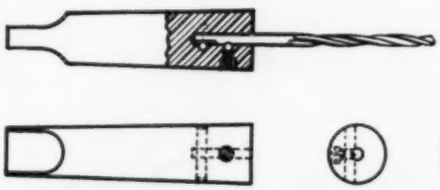

Fig. 7 - The drill is held in place by the ball and spring and is driven by the pin and flat on the end of the drill

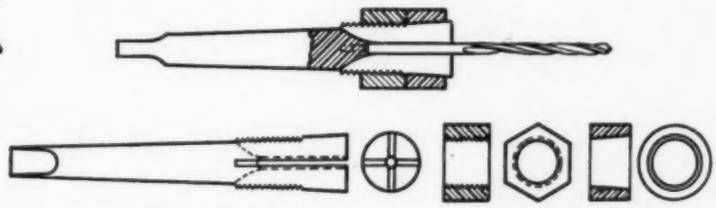

Fig. 8 - The driving friction is supplied by the nut and tapered collar

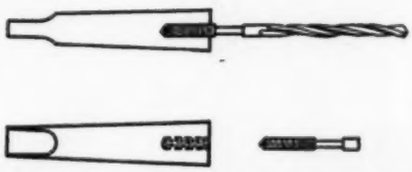

Fig. 9 - A simple threaded connection is used

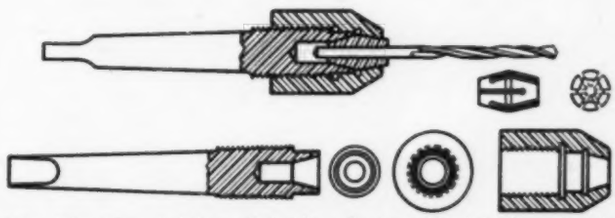

Fig. 10 - The driving friction is supplied by the double taper collet and special nut or hood

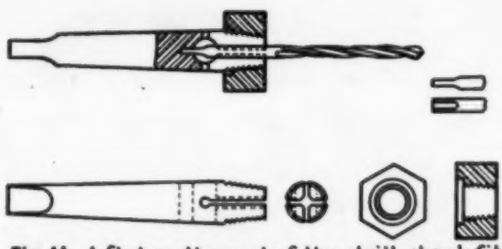

Fig. 11 - A flat on the end of the drill shank fits in a slot in the socket milled deeper than the hole. A tapered nut provides friction for locking the drill in place

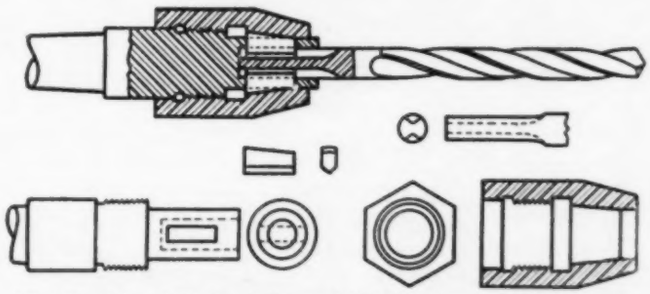

Fig. 12 - The drill shank is provided with two grooves into which the V-shaped jaws are fitted and made to grip the drill

PRODUCTIVITY

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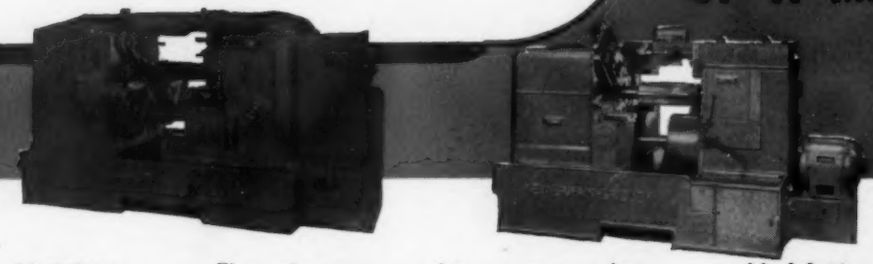

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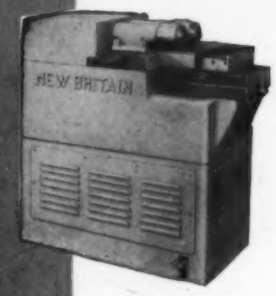
The only screw machines you can buy today which measure up to the cutting tools of tomorrow. Two lines, seven models, 4-6-8 spindles, capacity to 2¼".

Model 61



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Four new contour turning and boring machines . . . cam and air actuated, accurate and fast with set-up flexibility.

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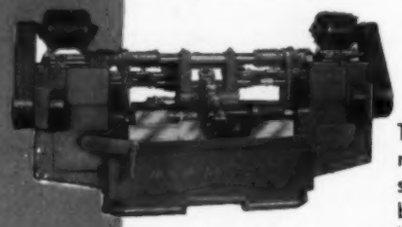
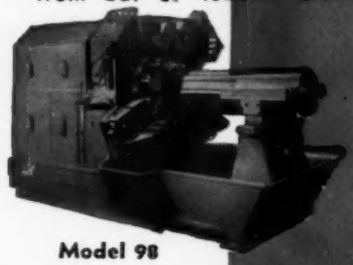
A new line of single spindle automatics, engineered for carbides and fast set-up, for economical high speed production of large pieces from bar or tubular stock.





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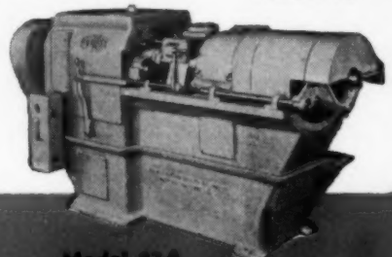
The world's standard in open end, work rotating, chucking machines, 4, 6 and 8 spindles, capacity to 12", supplemented by double end and tool rotating chuckers. Utmost efficiency for any chucking job.

Model 98



Model 65 **Model 22A**

Have you considered the enormous, new possibilities of automatic machinery? Are you robbing yourself of the cost-cutting tools your competitors are adopting?

We will gladly supply catalogs and specific case histories to show you how others are using New Britain Automatics to broaden profit margins.

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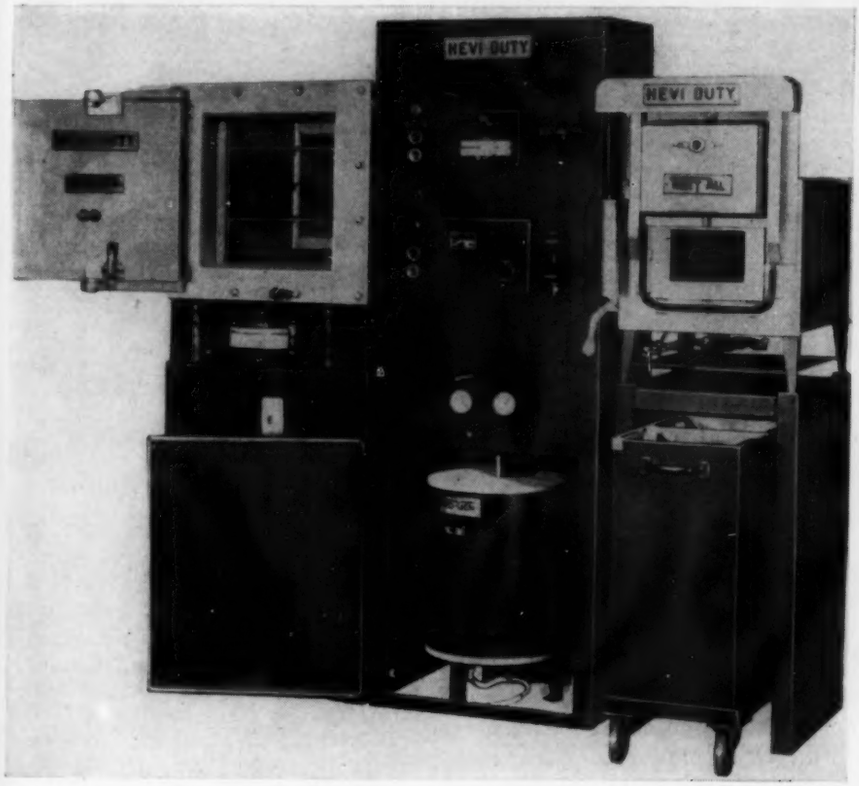
Shop Equipment News



Hydralectric Cutting-Off Machine Permits Boring, Drilling, Turning

Bardons & Oliver, Inc., Cleveland, Ohio, introduces the No. 35 Hydralectric cutting-off machine for chamfering and cutoff work on tubing, pipe or solid bar stock. Stock is fed through the hollow spindle by a motor-driven feed. A stock stop gages the length of the work. Two hydraulically operated cut-off slides, one front and one rear, are connected by an equalizing mechanism. Each slide takes a chip of approximately equal thickness, said to reduce cutting time by half.

Chamfering is done either by a drop-off tool on the rear slide or by an overhead chamfering attachment automatically actuated by the front slide. For parts requiring boring, turning or drilling, or combination in addition, a third or longitudinal slide can be furnished.

Collet chuck has a capacity of 5½ in. A hydraulic cylinder actuates the opening and closing of the collet chuck in automatically timed relation to the slide movements. Four spindle-speed changes are available, with pick-off gears providing a means for additional speed changes.

DoAll Abrasive Cutoff Machine In Dry-Type, Wet-Cutting Models

Two abrasive cutoff machines are announced by DoAll Co., Des Plaines, Ill. Model D-2 is a dry-type machine using a 10-in. wheel mounted on a swinging arbor, and powered by a 3-hp. motor. Model W is larger and includes a coolant tank and pump for wet cutting. It uses a 16-in. wheel, powered by a 7½-hp. motor. Coolant

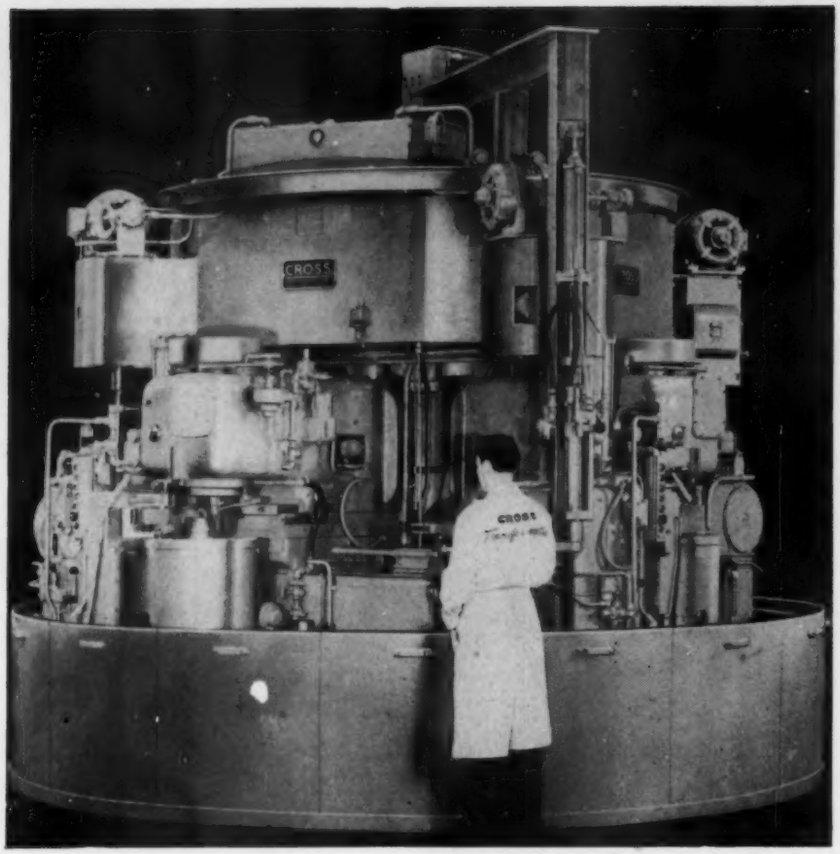
is said to reduce cutting speed slightly but assures better wheel life and surface finish. Tolerances as fine as 0.003 in. are said to be possible.

Both machines are designed to provide high wheel speeds for fast cutting. Capacity of Model W is 3-in. tubing or shapes, 2-in. solid bars. Model D-2 cuts solids to 1 in., tubing and shapes to 1½ in.

Added Chip Room Available on Three-Flute Tapered End Mill

A line of regular double-end mills with three cutting edges is offered by Cadillac Cutter Co., 1613 Eastern Ave., S. E., Grand Rapids 7, Mich. Mill is said to hog metal as fast as the 2 flute, and leave the finish of the 4 flute, and with the added chip room, it is said to cut faster and run cooler than the 4 flute.

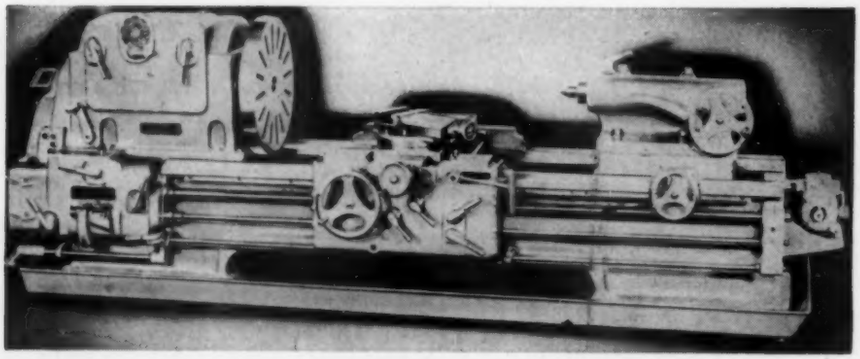
Hook rake angles are designed to give maximum shearing action. Tool is made without a center hole in the end which allows milling straight down in work before starting cut.



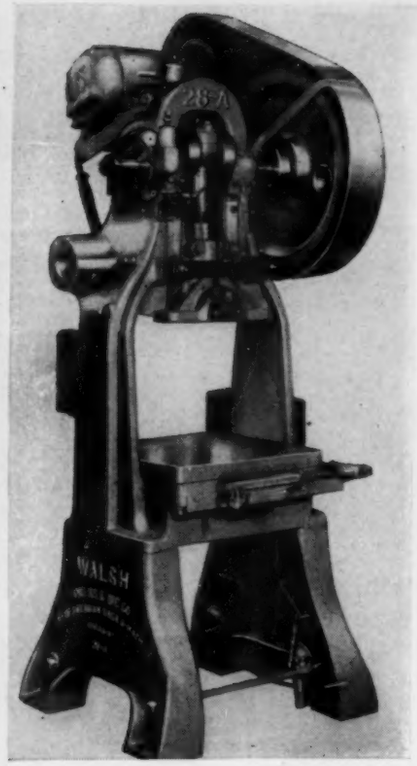
Continuous-Cycle, 4-Station Machine For Oil Well Joint Thread Milling

A four-station, continuous-cycle machine, requiring one operator, is offered by The Cross Co., Detroit 7, Mich. Output at a higher rate of efficiency is said to be assured because machine sets pace for operator, who unloads, loads, and presses a button. Power rapid traverse automatically positions work with cutter. Entire machine rotates, each station coming to operator as part is finished. Four pieces are completed with each revolution. A Servo-controlled hoist lifts parts in and out of the hydraulically operated chucks.

Rough and finish cuts are taken at the same chucking. Infeed, outfeed, and taper are cam controlled. Cutting speed is 300 sfpm. with high-speed steel hobs.



HEAVY-DUTY 32-in. engine lathe featuring a 16-speed dial-controlled all herringbone-geared headstock is made by Sidney Machine Tool Co., Sidney, Ohio. Gear box provides 48 changes of threads from ¾ to 46 tpr. and 48 feed changes from 0.003 to 0.207 in. per revolution of spindle. Spindle and intermediate shafts are supported by center bearings and end bearing supports



No. 28A Arch Press by Walsh Trims Die-Castings, Plastics

Walsh Press & Die Co., Div., American Gage & Machine Co., 4907 W. Kinzie St., Chicago, Ill., announces the No. 28A arch press for die-casting trimming, forging trimming, plastic and rubber trimming, and the fabrication of sheet metal.

Bolster area is 23x24 in.; bed opening is 19x15 in. Distance between uprights is 24 in., and distance between press bed and gibs is 19 in. Press is available as a flywheel, back-geared, or flywheel press with a gearhead motor.

NT 320

Airco Oxyacetylene Welding Torch Operates Tips from Nos. 0 to 13

An oxyacteylene welding torch, the Airco 800, is offered by the Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y. Torch is 11½ in. long, and has a capacity for operating single-flame welding tips from Nos. 0 to 13 as well as multiflame tips up to No. 15, indicating that almost any welding job from the thinnest sheet metal up to 1½ in. in thickness can be handled.

Each welding tip is assembled with an individual mixer for better flame control. Torch head is made of monel metal. Also offered is a smaller version of this torch known as Airco 700, with welding tip sizes from No. 0 to 10.

LODGE & SHIPLEY LATHES at work

NOTED MANUFACTURER approves LODGE & SHIPLEY lathe due to the convenience and simplicity of operation ...reports "OUTPUT VERY GOOD...EXTREMELY ACCURATE..."

From practically every corner of the well-known A. B. Dick Company's plant in Chicago come maintenance jobs for machining on Lodge & Shipley Lathes. Ferrous and non-ferrous parts worked, include "gear blanks, shafts, rolls from 2" to 14" diameter, valve seats and discs," as well as parts from other equipment too numerous to mention.

Utilizing to the fullest the wide range of speeds, feeds and threads available on Lodge & Shipley Model "A" Lathes, the A. B. Dick Company uses carbide and standard high speed tools to obtain excellent production. All types of lathe operations are performed including "boring, turning, facing, internal and external threading, tapers both internal and external."

Let LODGE & SHIPLEY Engineers survey any lathe operation in your plant. He may be able to show you how LODGE & SHIPLEY Lathes "pay their way" in production increases and other profit-making advantages. Write for Condensed Catalog showing complete line.

THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3035 COLERAIN

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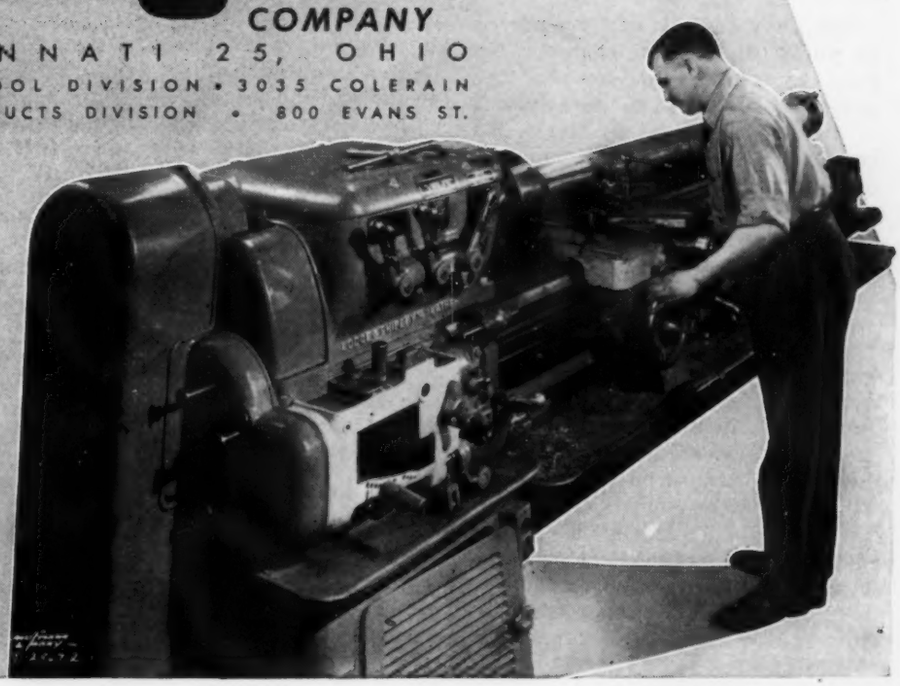
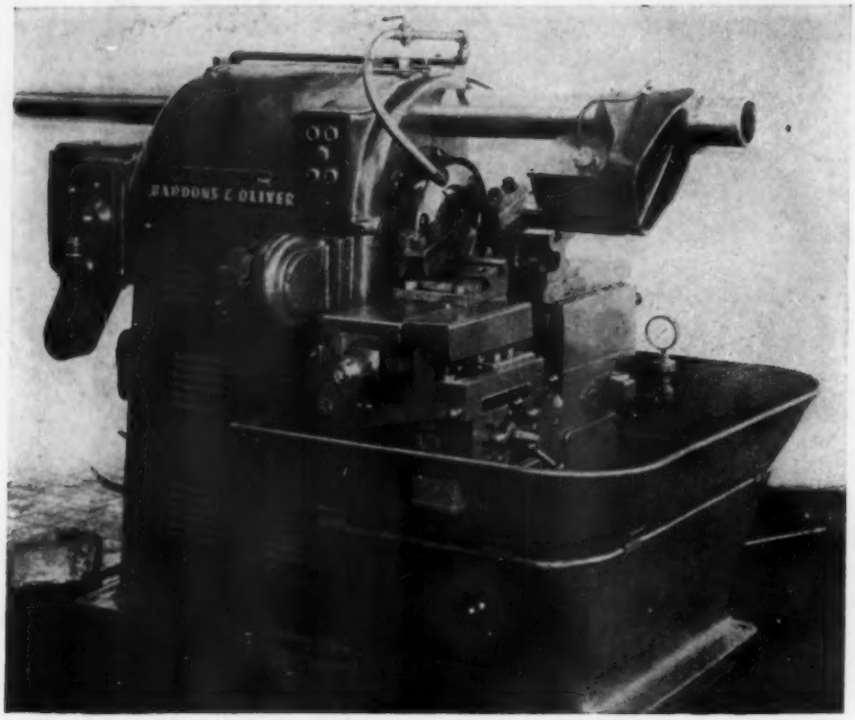


Shown is a 14" LODGE & SHIPLEY Model A Engine Lathe machining a mandrel from a Cameron Paper Re-Winding Machine. This is one of the jobs requiring the "extreme accuracy" reported.



palm-fit grip said to reduce fatigue, no protruding screws or bolts, metal safety handle stop, 30% greater tool strength in sections and handles, jaws marked to show capacity and type of metal safely cut, and red color finish.

Motorized Hydraulic Presses Available in Gap, 4-Post Type

A line of motorized hydraulic presses with capacities of 3, 5, 7, 10, and 25 tons is offered by Munton Mfg. Co., 9400 Belmont Ave., Franklin Park, Ill. Presses can be used for straightening, forming, and many similar operations.

Pressure is pushbutton controlled. Units are available in either gap or 4-post type. The 3-ton gap type has a 3-in. stroke, 3-in. throat, and 6-in. daylight opening. The 10-ton gap type, has a 7½-in. stroke, 9-in. throat, and 19-in. daylight opening.

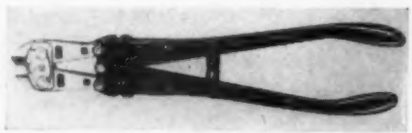
Furnaces, Atmosphere Generator Offered As Heat-Treating Units

A means for uniform heating of metals and other materials is introduced by the Hevi-Duty Electric Co., Milwaukee 1, Wis. Known as the Hevi-Duty Electric Temperite furnace, it is designed primarily for tempering or drawing of tool and die steels.

The alloy baffle is easily removed by pulling it from the chamber. No bolts or fastening devices are required to keep it in place. Fanshaft is directly connected to motor. No coupling is required. Maximum operating temperature is 1250 F. Work chamber dimensions are 12½x13½x 14½ in.; over-all dimensions, 27x 31x31 in.

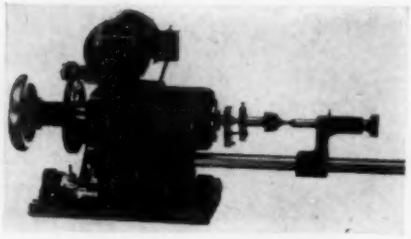
The Hevi-Duty Atmo-Gen unit was developed for use as a small capacity, atmosphere generator, and can be used in connection with copper and silver brazing, non-decarburizing, hardening, and other operations. Generator has an electrically heated vertical-type furnace in which a catalyst-filled alloy retort is located. Ammonia is passed through the heated retort and cracked to form nitrogen and hydrogen. Maximum operating temperature is 1850 F.; over-all dimensions, 15x30 in.

Another product of the company is the Treet-All furnace used as a small multi-purpose furnace for heat-treating operations to 1850 F. Furnace incorporates a fabricated Inconel muffle and gasketed door. Muffle permits the use of a minimum flow of atmosphere. No purging time is necessary, requiring atmosphere to flow only when parts are being treated in furnace. Carburizing, dry cyaniding and scale-free, non-decarburized hardening operations can be performed. Raw gases such as methane can be used without affecting the heating elements.



Line of Hand Power Cutters Redesigned by H. K. Porter

The line of hand power cutters manufactured by H. K. Porter, Inc., Somerville, Mass., has been redesigned. Improvements include curved toe-in handles which decrease arm-spread and wrist bend, rounded



Glenbard Radial Relief Fixture Eliminates Need of Special Cams

A radial-relief fixture for producing cutting tools is offered by Glenbard Tool Mfrs. Inc., 216 N. Clinton St., Chicago, Ill. No special cams are needed to regulate spiral or radial relief. Indexing of flutes desired, from one to six, is controlled by a quick gear change. Teeth are said to cut in a true circle due to geared indexing.

By reversing the actuating cam, lefthand work can be handled. Tools can be cylindrically ground either in the collet of the fixture or between centers by disengaging the actuating mechanism. After form is ground, the actuating mechanism can be engaged and tool radially relieved, without removing the fixture from the machine.

Work up to 1-in. dia. can be accommodated in a draw-bar collet. An adapter facilitates the use of a chuck or face plate. Work to 4½-in. dia. and 12-in. long can be handled between centers. All types of end-cutting contours can be produced.

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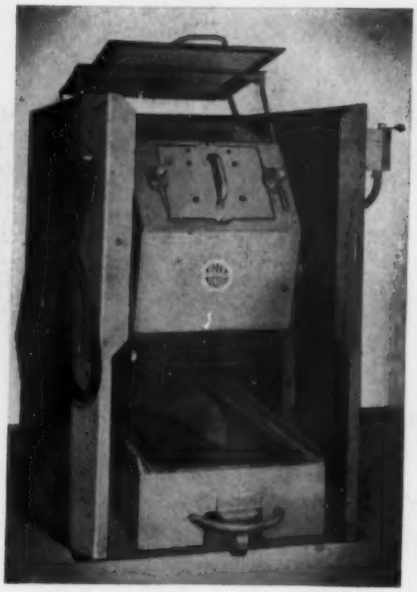
JONES & LAUGHLIN STEEL CORPORATION



Sturgis Roto Finish Machine For De-burring, Finishing

Sturgis Products Co., Sturgis, Mich., offers a one compartment Roto-Finish machine for small mechanized de-burring and finishing installations. Listed as the CW-22-1 Model, the one compartment cylinder, 19 x 32 in. I. D., is equipped with a full-size, light-weight door with a molded rubber gasket. Design and operation features are the same as the CW-45-2 and CW-60-2 machines.

Standard equipment includes a forward and reversing switch with synchronized magnetic brake, water attachment, 1½-hp. 3-phase motor with gear reducer, and a swivel type, 3-point-suspension hoist pan.

Spot Light by Westinghouse Plugs into Any Power Outlet

Industrial spotlight, for clear illumination of welding, cutting, or brazing work when viewed through a No. 10 welder's glass before striking the arc, has been developed by Westinghouse Electric Corp., Pittsburgh 30, Pa. One spotlight casts a small-diameter circle of light from 2500 - footcandle brilliance when placed 3 ft. from work to 1000 footcandle brilliance when located 6 ft. away.

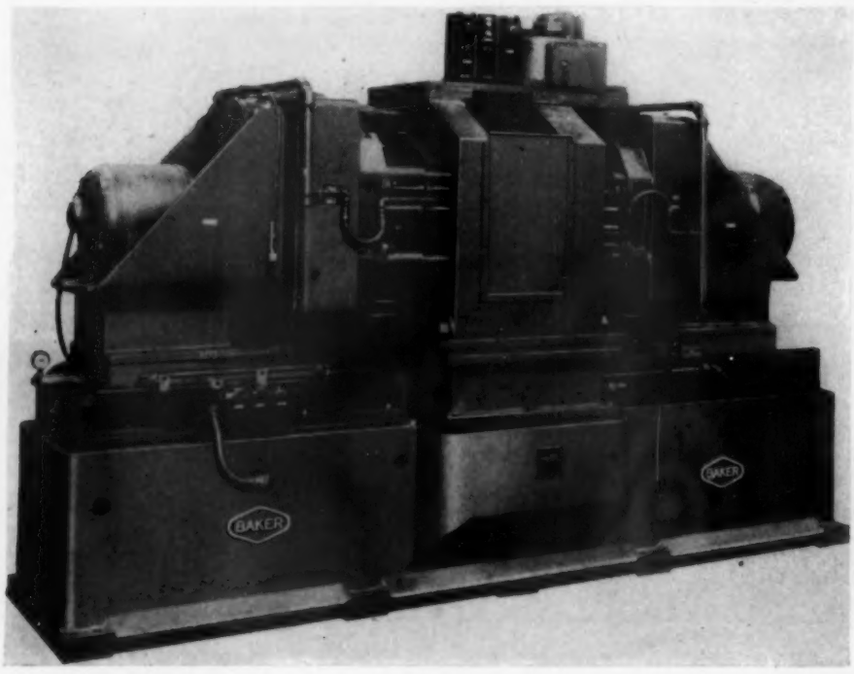
Light uses a 6-v., sealed - beam type lamp operated from a transformer built into the light housing, and can be plugged into any outlet as power requirement is only 30 watts at 115 v., 60 cycles. Work is made more comfortable as practically no heat is generated.

Tabor Mfg. Cut-Off Machine Cuts Brass, Bronze, Steel

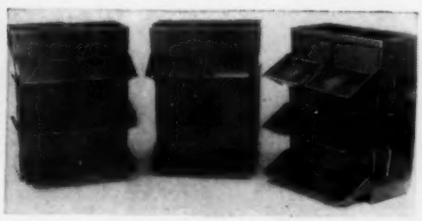
Machine for cutting brass, bronze, and steel in bar stock, tubing, angles, and flats, is offered by The Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa. Featured is a quick-acting clamp, and a handwheel for adjusting start of tension. Two clamps, one on each side of the wheel, hold work securely in V-blocks, and are said to eliminate need of end support for uncut stock.

At beginning of cut, the adjustable stop swings to an upright position, preventing the cut piece from binding the wheel. When wheel is retracted after cut, the stop falls back into position.

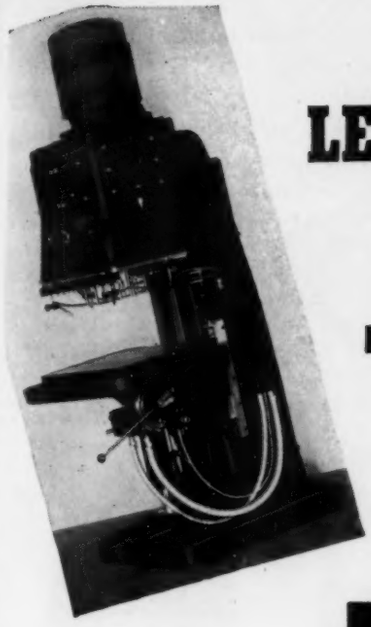
Coolant is fed to both sides of wheel at the hub, and then thrown centrifugally at the cut. Coolant reconditioning is done in a primary and secondary settling tank. No filter cloths are used.



TWO-WAY horizontal machine for high production machining of automobile connecting rods and caps is made by Baker Bros., Inc., Toledo, Ohio. Machine is furnished with a six-station trunnion-type power index fixture arranged to clamp one connecting rod and cap at each station. Two hydraulic-feed saddle units are incorporated. Right unit is equipped with a 20-spindle fixed-center multiple head, assembled with a self-contained lubricant pump. Left unit drives a 12-spindle head



ADJUSTABLE FEED stacking hoppers, Type B, are announced by The Gordon L. Hall Co., Old Lyme, Conn. Units are flexible in arrangement, and are furnished in five sizes varying in capacity from 30 to 250 cu. in. Each bin has a slide at the front for adjusting size of opening. Bins have gravity feed and till-type fronts



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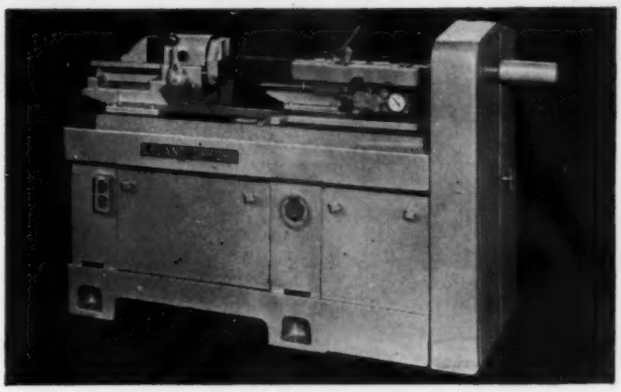
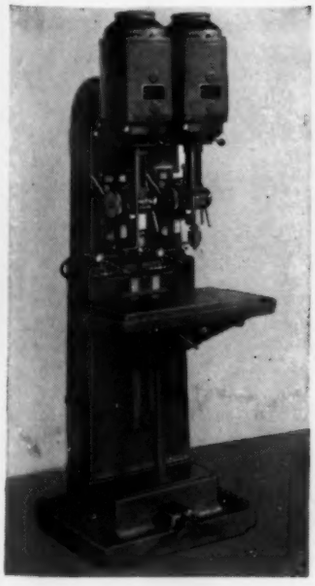
to meet your every need.
Individually motored spindles
Speeds instantly selected
Wide speed ranges





NO. 1 SUPER HIGH SPEED

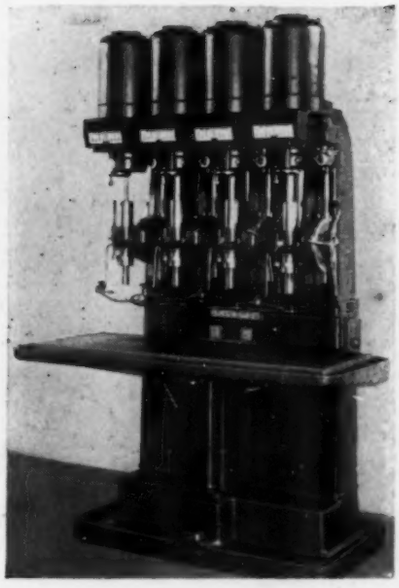
NO. 2 TO CAPACITY OF NO. 2 M.T.

NO. 3 TO CAPACITY OF NO. 3 M.T.

NO. 4 FOR HEAVY DUTY

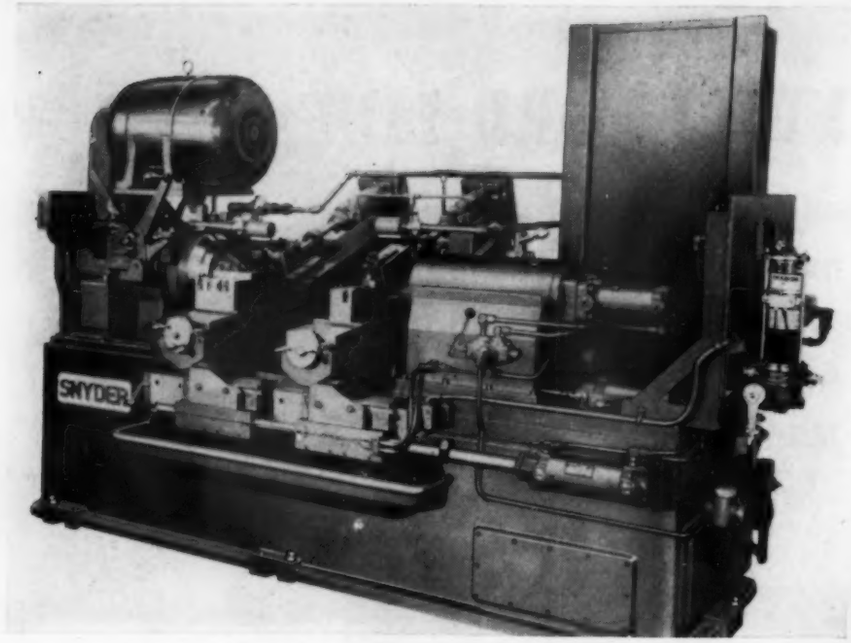
• • •

VERTICAL AND HORIZONTAL
DEEP HOLE DRILLING MACHINES
16 SPINDLE ADJUSTABLE



LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

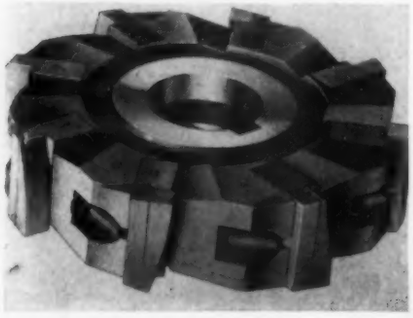


Snyder Automatic Hydraulic Lathe Incorporates Two Turning Carriages

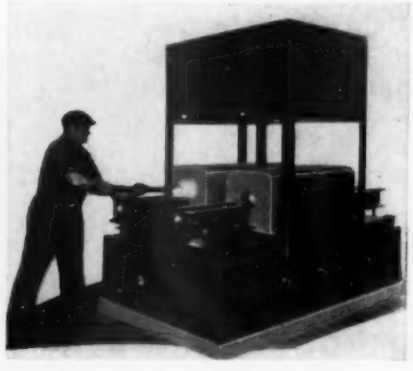
An automatic hydraulic feed lathe is introduced by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit, Mich. Machine illustrated is tooled for turning and facing automotive rear-axle shafts and in one operation finishes all diameters and faces to size, with the exception of grinding stock on bearing and oil-seal diameters. Output is said to be 75 to 80 pieces an hour when lathe is rated at 80% efficiency.

Machine incorporates two turning carriages, two facing slides and hydraulically operated quill-type tailstock. Feeds are hydraulic and are adjustable by dials for each attachment. Spindle speeds are controlled by pick-off gears.

All moving parts are automatically lubricated. Machine occupies 68x110 in floor space.



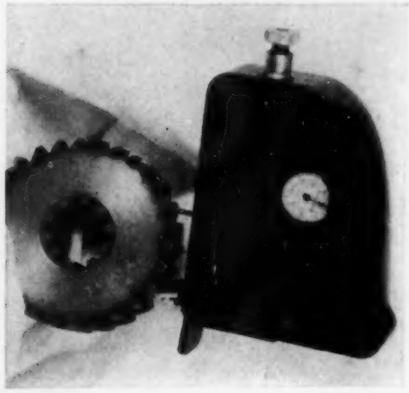
CARBIDE-TIPPED curved tooth milling cutter is provided with special locking screw for locking carbide blade rigidly to cutter body. Made by Aber Engineering Works, Inc., Waterford, Wis., the curved tooth shearing action counteracts the inherent brittleness of carbide and is said to reduce amount of horsepower required. Cutters over 1-in. wide come with inserted carbide blades; under 1-in., brazed-in blades



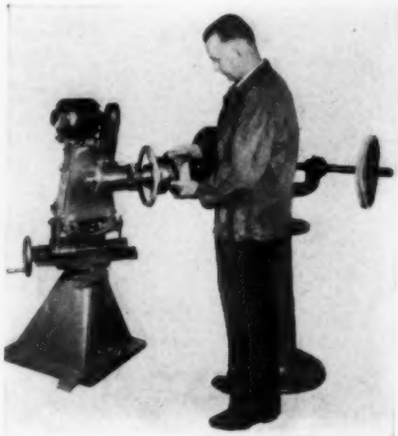
Ajax-Northrup Induction Heater Turns Out One Bar Each Minute

Ajax Electrothermic Corp., Trenton 5, N. J., introduces a self-contained high-frequency induction heater for reheating parts to the proper forging temperature. Called the Ajax-Northrup induction heater, the unit is located right at the forging machine and turns out one bar every 60 sec., timed right to the forging operation.

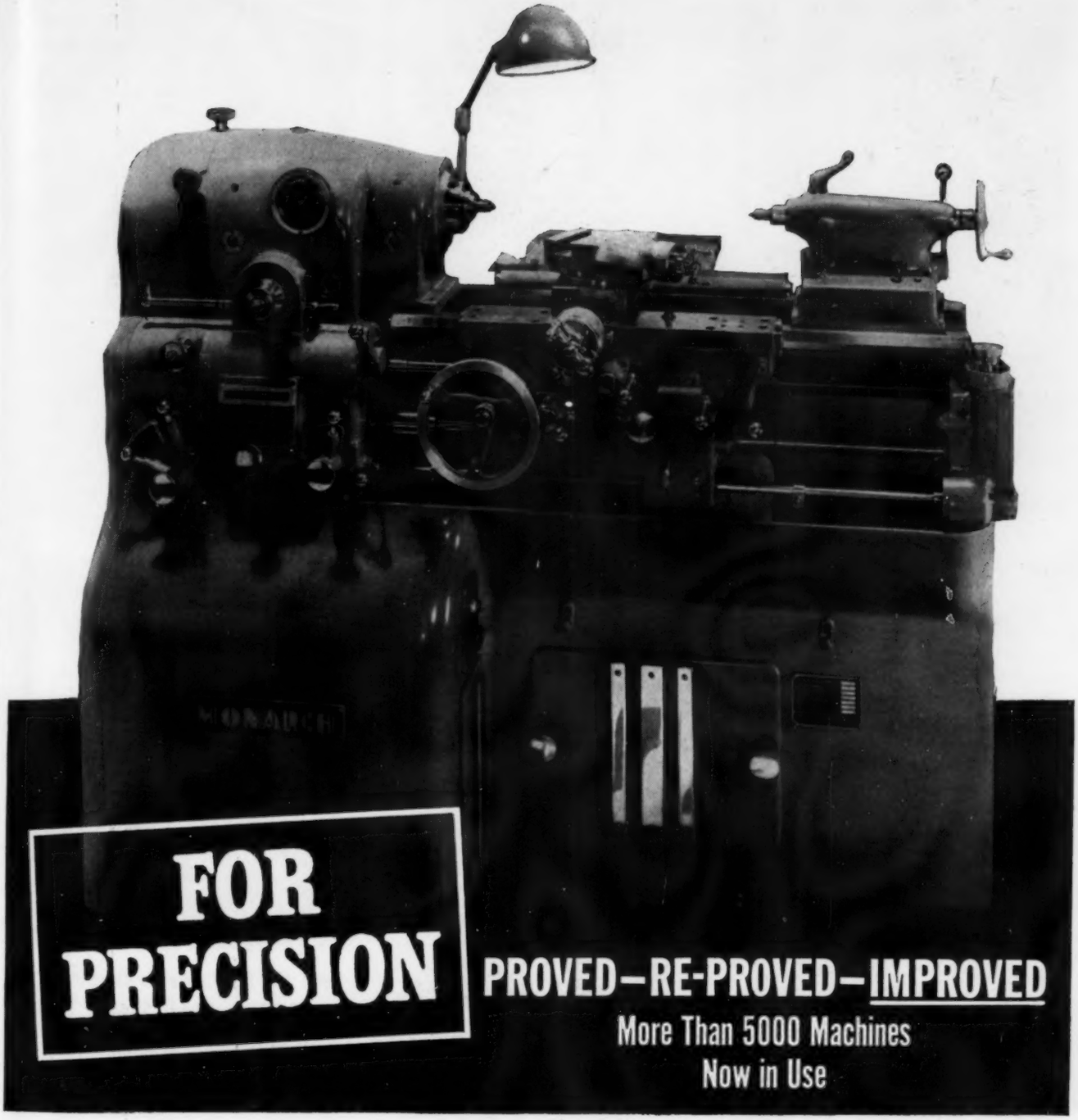
Bars 4 in. square and up to 36 in. long that have cooled are fed onto rollers to the induction furnace where they are reheated on an automatically timed heating cycle to emerge at the forging temperature desired. Unit illustrated is size for 4-in. bars, and has twin heating coils, each of which draws 125 kw. of 960 cycle power.



SYSTEM of measuring and checking spur, and helical gears is introduced by Urbauer Engineering Co., Naperville, Ill. Called the Gearmaster, unit consists of a precision micrometer and specially designed gear charts. Chordal measurements, tooth spacing, tooth thickness, diametral pitch, pressure angle, backlash allowance, and pitch diameter are all determined in one operation



ELECTRICALLY powered buffing and polishing machine, Type V-1, is offered by Vanott Machine Corp., 234 Colgate Ave., Buffalo 20, N. Y. Unit is designed to handle many different shapes as it is fully adjustable for height, angles, spindle speed, and stroke up to 6 in. All important parts are inclosed



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More Than 5000 Machines
Now in Use

The Monarch Model EE 10" Sensitive Precision Toolmaker's Lathe

A sensation when it was first introduced in 1938, the Monarch Model EE Toolmaker's Lathe has recently undergone additional design refinements—to give you still more plus values that make this superlative turning machine even better than ever.

Its accuracy, sensitivity and ease of operation are unsurpassed by any lathe, at any price. Outstanding is its wide range of infinitely variable spindle speeds.

Its accuracy is in-built—*and basic*, starting with the famous Flame-Hardening process for bedways pioneered by Monarch more than a decade ago. To this is added induction hardening of lead screws, compound and cross-feed screws—and myriad other design and production refinements, all calculated to give you the most in metal turning. Complete details are contained in Bulletin 302. Write for your copy.

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Monarch
TURNING MACHINES

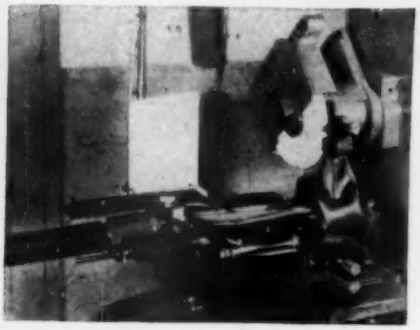
THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER* —— TURN TO MONARCH

Pneumatic Double-Action Jig-Vise Clamps for Repetitive Drilling

A pneumatic double-action jig-vise for clamping repetitive work to be drilled, filed, ground, polished, or assembled, is offered by Deublin Co., Northbrook, Ill. All operating parts are enclosed. A grease-pocket system maintains constant lubrication of all moving parts.

The open-front design speeds the setting and removal of work from any of the three sides available. A double-acting air cylinder, with a 1-in. stroke, requires one air line for positive power in either direction. The air-control valve is adaptable to either left- or right-hand manual operation or automatic use. Clamping pressure can be adjusted from 0 to 10 times line pressure. Unit can handle work of heavy-sectioned material as well as thin-walled plastics.

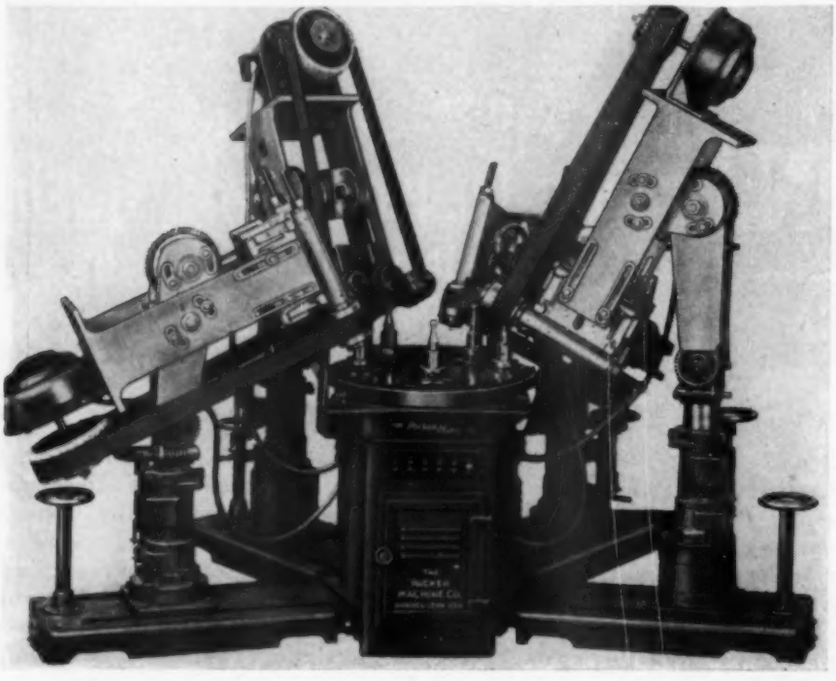


Hoglund Contour Wheel Dresser Has Stylus Control From Templet

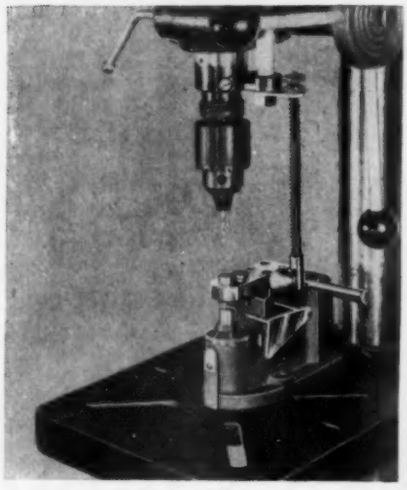
A contour wheel dresser is offered by Hoglund Engineering Co., Inc., 697 Selfmaster Parkway, Union, N. J. The high-precision abrasive wheel dresser operates on a 10 to 1 ratio from a templet which controls the movements of the diamonds through a stylus. All errors in templet are reduced in a ratio of 1 to 10 through application of hydraulic principles. The limitation of the contour to size or shape is the size of the diamond. With the 0.002-in. radius diamond concave radii 0.002 in. or larger can be generated.

The complete set of five diamonds contains three 60° points with 0.002-, 0.005- and 0.010-in. radii, one 72° point with 0.015-in. radius and one 90° roughing stone. Diamond-dressed abrasive wheels are said to give the best finish and highest degree of accuracy.

Dresser is not attached to machine and can easily be moved. Vital parts are dust-protected with neoprene moldings. Unit has a 10-in. dia., 1⅛ in. wide wheel capacity, and 8⅝-in. height from base to center line of diamond.



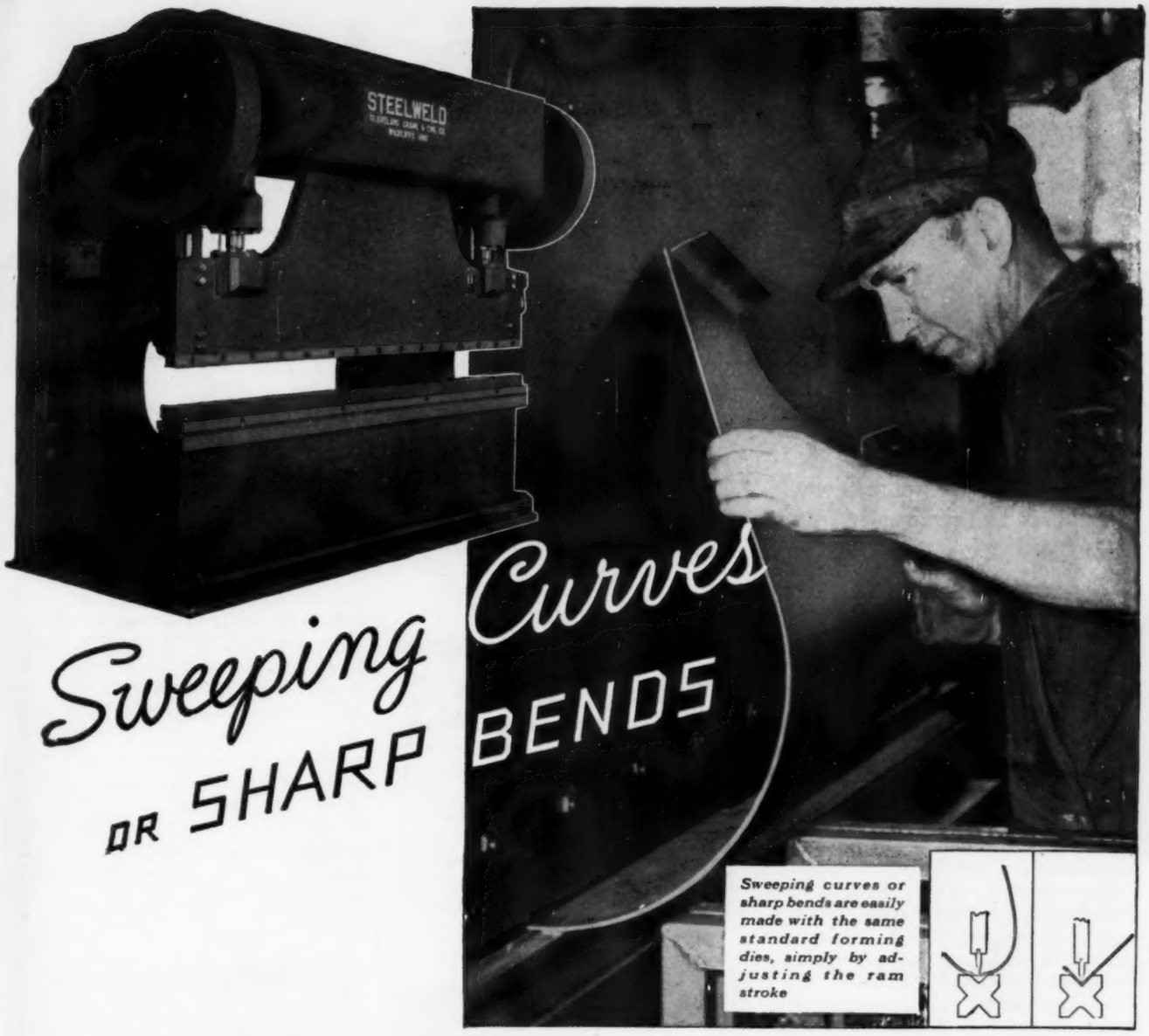
ABRASIVE-BELT head for automatic polishing and buffing is adaptable to most types of Packer-Matics. Made by the Packer Machine Co., Meriden, Conn., unit has an interchangeable head, permitting various types of wheel applications as well as use of abrasive belts. Head can be used with buffs, polishing, tampico and wire wheels



Drill Jig for Cross Drilling On Pins, Small Shafts, Tubing

The Manufacturer's Engineering Service, Security Bldg., Toledo 4, Ohio, announces the Kam-Grip Model 750 drill jig, designed for cross-drilling operations on a variety of diameters and hole sizes on pins, small shafts, tubing, screws, and other parts.

Cam action is employed to actuate anvil up and down, to and from locking position. Features include manual or automatic operation, and adjustable side stop for accurate positioning of hole. Unit is furnished with two bushing plates, two double-end anvils, and lock-release rod. Bushing plates take standard slip bushings to 11/32-in. hole size. Double-end anvils take round-work stock from ⅛- to ¾-in dia. Special anvils are available.



Sweeping Curves OR SHARP BENDS

Sweeping curves or sharp bends are easily made with the same standard forming dies, simply by adjusting the ram stroke

For decades plate has been sharply bent — or curved — corrugated — punched — and formed into various shapes. But can you think of any ONE method or machine prior to the development of the bending press, that could perform all of these operations speedily and easily?

In this modern world where efficiency is becoming ever more important, no one working with plate in thickness up to an inch can afford to be without a bending press. As applied to metal forming, it is a lathe, a shaper, a planer, a boring mill and drill press, all rolled up into one.

Sweeping curves and sharp bends are only a few of the many operations that can be performed on a Steelweld. With dies available, and simple ones that are easily made, the kinds of work that can be produced are practically limitless.

Now, more than ever before, it is important that you be keyed up to do all kinds of forming work with dispatch and accuracy. We urge you to get the facts on this modern tool.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

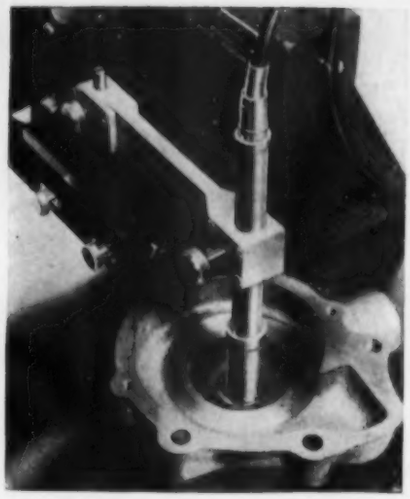
THE CLEVELAND CRANE & ENGINEERING CO.

1402 East 281st ST., WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

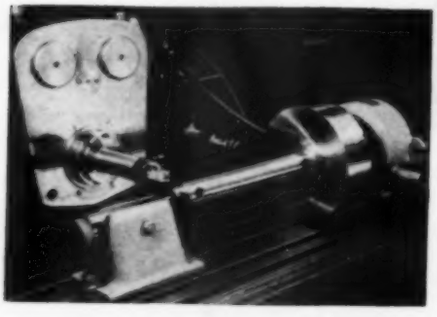


Surface Roughness of Blind Holes Measured by Profilometer Tracer

A Profilometer tracer for taking surface roughness measurements on the bottoms of blind holes and on recessed flats and shoulders is marketed by Physicists Research Co., 321 S. Main St., Ann Arbor, Mich. Listed as Type GA, unit will measure in holes as small as 1 in. in diameter, and can be used for depths to 5½ in. Diamond point projects from the tracer, and is self-adjusting to the surface being measured.

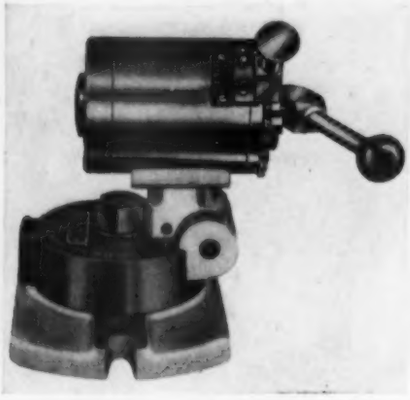
The tracer can be used with any Profilometer, and is operated by means of a Type A piloting fixture. Measurements on very smooth surfaces to 2 microinches and less are said to be obtainable. It is not recommended for use on surfaces rougher than 100 microinches.

Tracer point has a vertical adjustment of 0 to 5⅞ in. above the base plate, and a 1/16- to 1⅛-in. range of trace is provided.



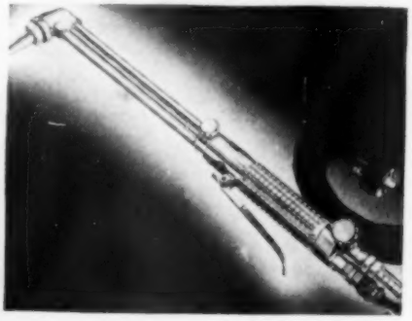
Fixture for Milling Operations Holds, Indexes Automatically

An automatic holding and indexing fixture for milling operations is offered by Erickson Tools Div., 2309 Hamilton Ave., Cleveland 14, Ohio. Fixture can be indexed automatically by connecting it with table control. Part held is located from the outside diameter. An adjusting screw permits a wide selection of index positions. Concentric holding and alignment are said to be assured, milling operations being rigidly parallel with center axis of work.



Matco Dividing Collet Head Adds Tailstock Attachment

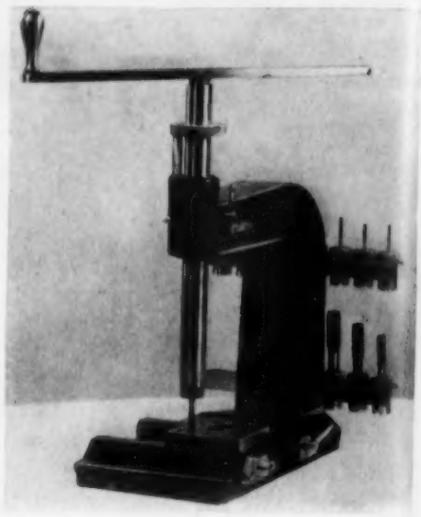
The improved universal dividing collet head, manufactured by Matco Tool Co., 2834 W. Lake St., Chicago 12, Ill., features a tailstock attachment for added advantages in centering work. A lever-action collet closer is also featured. Other attachments available include radius and angle wheel end mills and milling cutters. Collet head takes to 1-in. capacity 5C ground thread collets.



Torch for Flux-Injection Process By Airco, Cuts Stainless Steel

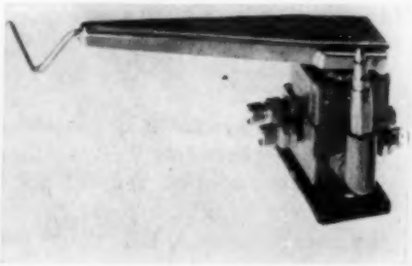
A hand torch for cutting stainless steel using Airco's flux-injection process, is introduced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

Called Style 9016, torch is available in a 21- and a 36-in. length. Both lengths come with a 90° torch head. A remote control cutoff automatically coordinates the flux feed with the cutting oxygen, eliminating separate flux control. Standard cutting tips can be used.



Single-Spindle Tapper, Threader Offers Direct-Reading Depth Gage

The bench model No. 12 single-spindle tapper and threader, for bench or wall mounting, is offered by Lassy Tool Co., Plainville, Conn. A direct-reading depth gage is featured. The single spindle is hollow for lightness. Stepped holding bars provide a means for tapping small pieces as well as large without tap-breaking torque, and also provide a setup for tapping a quantity of pieces. Tap capacity is ⅛ to 1 in.; spindle diameter is 1¼ in. Table is 8x16 in., and distance from spindle center to bracket is 8½ in.



Dual Shutoff Station Valve For Oxy-Acetylene Welding

A shutoff valve, introduced by Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y., is designed to prevent oxygen and acetylene waste in production welding. Known as the Oxweld V-31 dual-station shutoff valve it controls fuel-gas supplies when used with the oxy-acetylene blowpipe.

Gas consumption stops when blowpipe is hung on hook. To light, blowpipe is lifted from the hook and tip is passed over the pilot light. Unit is designed for operating pressures to 100 psi.

This—

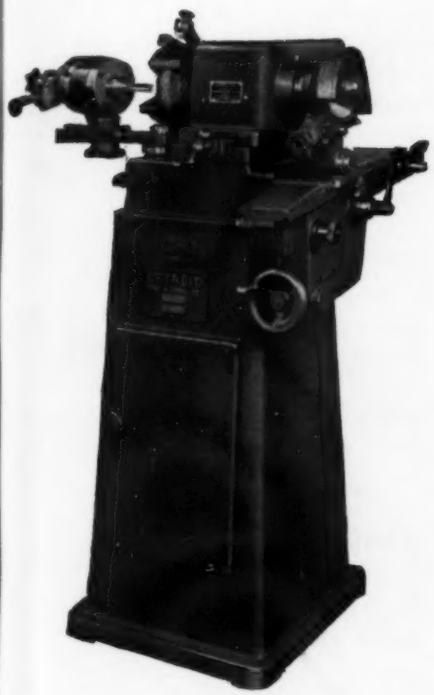
is the business end—

TAKE CARE OF IT

ON A

DETROIT

TAP RECONDITIONER



You can put worn taps right back in "good as new" shape with the DETROIT 4 in 1 tap reconditioner. It's like getting an almost unlimited supply of NEW TAPS for next to nothing, for this reconditioner is remarkably low in price—pays for itself in short order. It chamfers, grinds flutes (from 2 to 6), spiral points taps where required and polishes the points. Handles taps up to 1½ inch diameter.

For complete information write or wire for Bulletin #DTR-4.

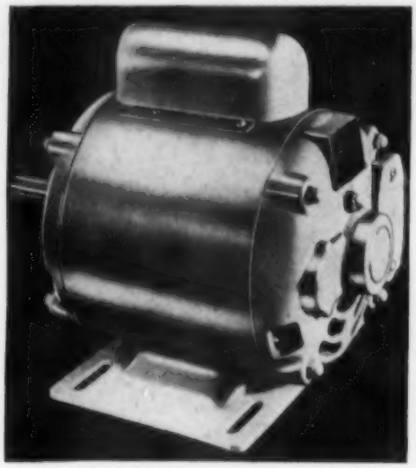
DETROIT

TAP & TOOL CO.

8432 BUTLER AVE. • DETROIT 11, MICHIGAN

The Home of "M-11" CHROME-COBALT HSS TAPS, THREAD MILLING CUTTERS & THREAD GAGES

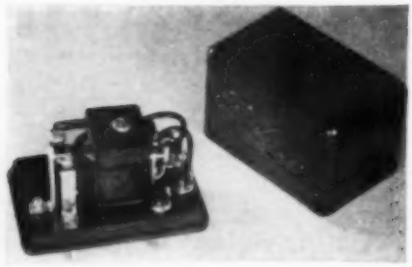
Parts and Materials



Three Lines of Electric Motors Introduced by A. O. Smith Corp.

Three lines of general-purpose electric motors called Permamotors are introduced by A. O. Smith Electrical Mfg. Co., New York 17, N. Y. They include fractional-hp. ratings, integral-hp. single-phase ratings, and integral-hp. polyphase ratings.

Fractional-hp. rating Permamotor, illustrated is of the capacitor-start, single-phase type. Available with NEMA mounting dimensions, they feature rugged squirrel-cage rotors. Also featured are the quick-break switch and positive-acting governor. The integral-hp. rating Permamotors are available in 1 to 5 hp.



Plug-Type Connectors on Relay Eliminate Wrong Connections

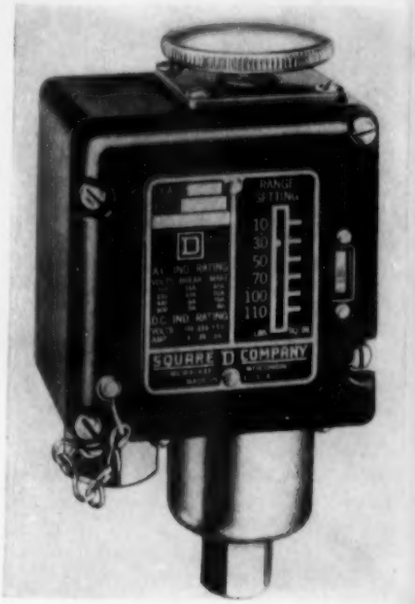
Grayhill, 1 N. Pulaski Rd., Chicago 24, Ill., announces a relay with plug-type connectors, which are inserted into receptacles on the machine. No wires have to be disconnected and chance of wrong connections when replacing are eliminated. Rear terminals can be furnished in place of the plug connectors if desired.

Available in various contact arrangements, the relay ranges from 6 to 230 v., ac. or dc. The silver contacts are rated at 10 amp. per pole on a resistive load. Unit is 3¼x 2 5/16x2 9/16 in. including height of plugs.

Westinghouse Vertical Gearmotor Has Nine Gear-Ratio Combinations

A vertical gearmotor featuring a self-contained drive consisting of a high-speed motor and speed reducing unit has nine different gear-ratio combinations ranging from 7.61:1 to 38.9:1.

Made by Westinghouse Electric Corp., Pittsburgh 30, Pa., gearmotors are available in 3 to 50 hp., 220, 440 or 550 v., 3-phase, ac., and 3 to 7½ hp., 115 or 230 v., dc. Units can be equipped with practically any standard motor in a variety of enclosure types. All gears and bearings receive positive lubrication at all operating speeds.



Pressure Switch by Square D Controls Pneumatic Machines

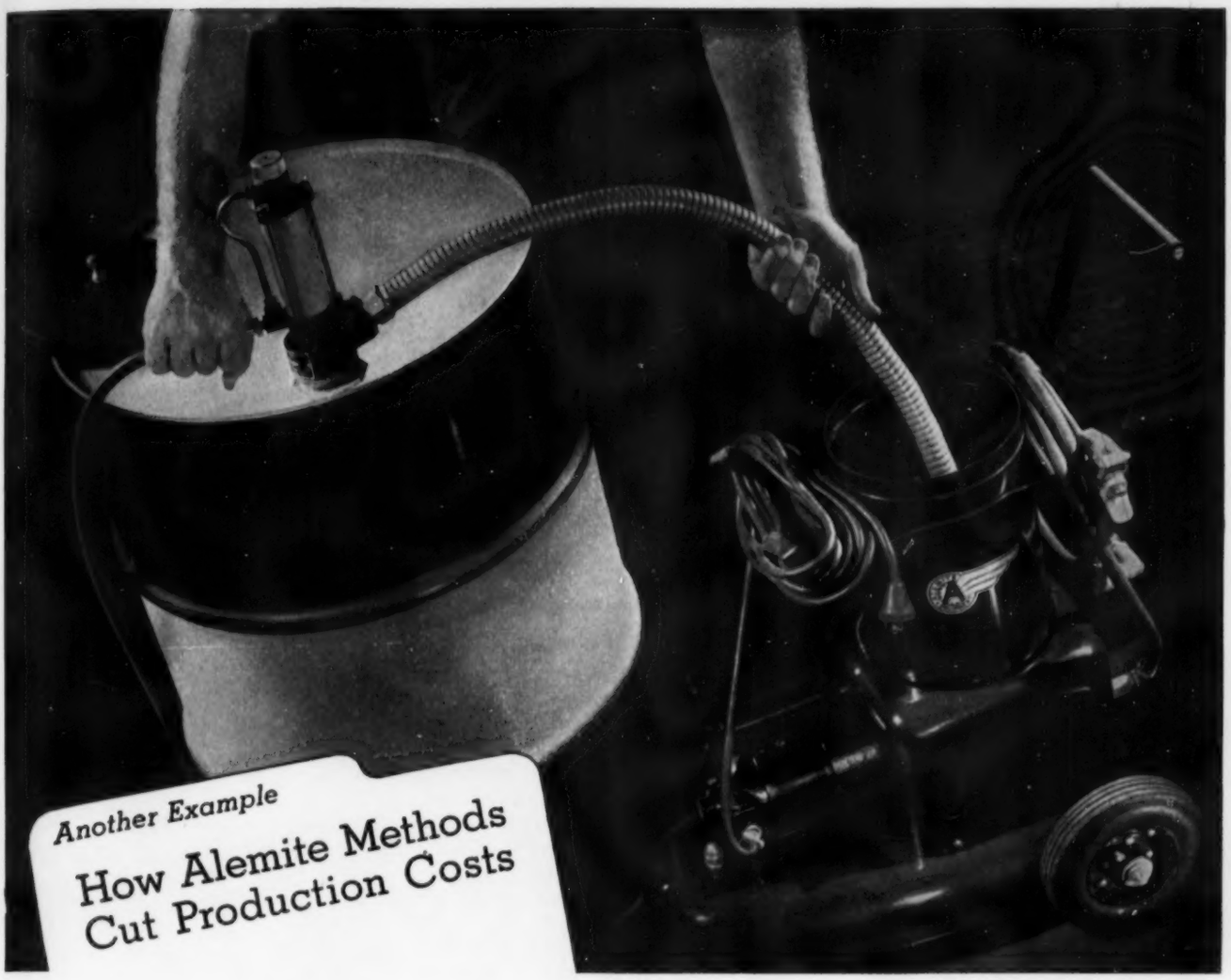
A pressure switch designed for application in the control of pneumatic or hydraulic machines is offered by the Square D Co., Industrial Controller Div., 4041 N. Richards St., Milwaukee 12, Wis.

Quick-made and quick-break action is assured by use of a precision single-pole, double-throw snap-switch mechanism. Operating rates to 300 per min. have been confirmed by tests.

A trip indicator operates behind a window in the cover, permitting observation of switch action. Bellows-actuated types are available in ranges up to 1000 psi. Piston-actuated controls for use in the hydraulic field are suitable for pressures up to 3000 psi.

Spiral-Grip Collet Serrations Are Staggered, Do Not Track

Shell Machine Co., 21306 John R St., Hazel Park, Mich., announces the spiral-grip non-slip collets. Serration pattern is said to present a 100% contact with the thrust surface of the stock. Serrations are staggered and do not track.



Ends Costly Bearing Failures

Your Lubrication Methods May Be More Antiquated Than You Suspect

A simple thing like transferring grease with a paddle may be boosting your maintenance costs—and that means lower productive capacity per dollar per machine. The Alemite Representative is a *specialist* in simplified, modern methods of handling and applying lubricants. A five minute conference with him may open your eyes to new cost-cutting ideas. Call your Alemite jobber or write to Alemite, 1899 Diversey Parkway, Chicago 14, Illinois.

Adds Productive Time to Machines by Fast, Clean Mechanized Handling and Application of Lubricants

Without human hands, dirt and moisture touching the grease, it's transferred in seconds direct from refinery sealed drums to the lubricating equipment. The result is mechanized barrel-to-bearing lubrication that ends all fear of costly bearing failures commonly caused by dirty grease.

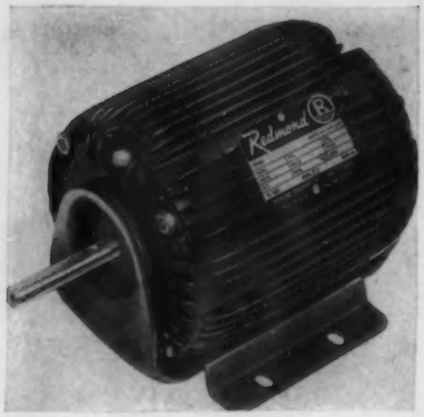
This is just one of the many Alemite methods that help to cut production costs. Dirty grease can chew up bearings . . . inadequate lubrication will burn them out. Eliminate these *two* dangers with this Alemite Method and save grease, manhours, and machine time.

The Alemite Representative can show you case after case where actual practice or a time study analysis have proved that Alemite Methods eliminate wasteful and time-consuming handling of oils and greases . . . reduce shutdowns for repairs . . . time-outs for lubrication, add more productive time to machines. He can show you how to lubricate as many as 300 bearings from *one* central point without stopping the machines! Get the facts!

ALEMITE

STEWART WARNER

MODERN LUBRICATION METHODS THAT CUT PRODUCTION COSTS



Fractional hp. 6-Pole Motors Run at 1000 rpm., Full Load

Redmond Co., Inc., Owosso, Mich., introduces 6-pole shaded-pole fractional hp. electric motors for applications specifying 1000 rpm. with full rated loads. Listed as Type Y Micromotors, they include ventilated models up to 1/15th hp., and totally enclosed models up to 1/20th hp. Both types handle deep pitch fans with a minimum of air sound.

Motors are especially suitable for use on hot air furnaces, exhaust fans, unit coolers and heaters. Flush-weld rotors, have filled slots said not to collect dust, dirt and chips.

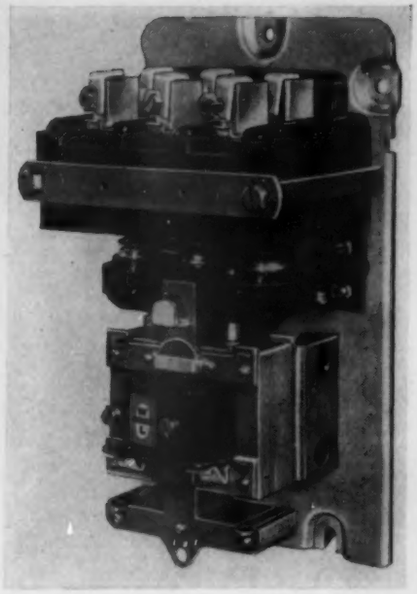
Acheson Colloids Die Lubricant Offered for Press Forging Brass

A die lubricant for press forging brass is introduced by Acheson Colloids Corp., Dept. 13, Port Huron, Mich. Advantages are said to include better parting, and clean and sharp forgings. Intricate shapes can be formed. Lubricant is a special dispersion of semi-colloidal graphite supplied in concentrated form and added to another fluid.

Flo-Trol Speed-Control Valve Adjusts Without Use of Tools

Flo-Trol De Luxe speed-control valve has been added to the Nopak line of air and hydraulic valves made by Galland-Henning Mfg. Co., Milwaukee 7, Wis. Valve requires no tools for adjustment, as the adjusting sleeve can be turned and set by hand.

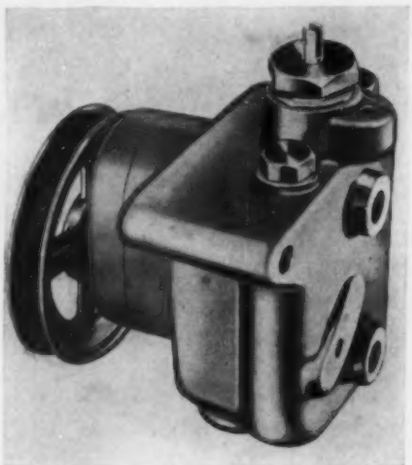
Unit is mainly brass and therefore has good rust and corrosion resistance. Oil, water and hydraulic fluids are said not to affect it. Valve can be inserted at practically any point in the air or hydraulic line and is said to have a large seating area.



Ward Leonard Solenoid Contactors Applicable to Resistive Heating

Solenoid contactors, primarily for use in ac. motor controllers, are introduced by Ward Leonard Electric Co., Mount Vernon, N. Y. Listed as sizes 2 and 3, they are also applicabe for resistive heating, and similar controls for remote and automatic load-switching purposes.

Unit features built-in solderless connectors, and double-break silver contacts. Sizes 2 and 3 units have maximum ratings of 25 and 50 hp. respectively on 440-550 v., 3 phase, 60 cycles.



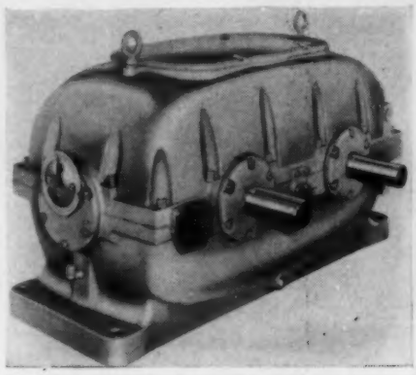
Midget-Size Hydraulic Power Unit Employs Four-Way Control Valve

A midget-size hydraulic power unit, the Ten-Ton-Tony, has been developed by Hydro-Power Div., The Hydraulic Press Mfg., Co., Springfield, Ohio. Unit can be used on arbor presses and hydraulic clamping vises, and for forming, straightening, and similar operations.

The Ten-Ton-Tony has a capacity of 3 gpm. of oil at 1200 rpm. at 1000 psi., or 4½ gpm. at 1800 rpm. at 1000 psi. It requires approximately 2½ hp. for operations at 1200 rpm. A four-way control valve permits the use of a double-acting cylinder that is hydraulically actuated in both directions.

Timken Tapered Bearings Offer Increase in Carrying Capacities

A 25% increase in the radial and thrust load-carrying capacities of their line of tapered roller bearings is announced by The Timken Roller Bearing Co., Canton 6, Ohio. Improved alloy steels, better metallurgical control, improved surface finishes, and better inspection methods, are factors involved in the increase.

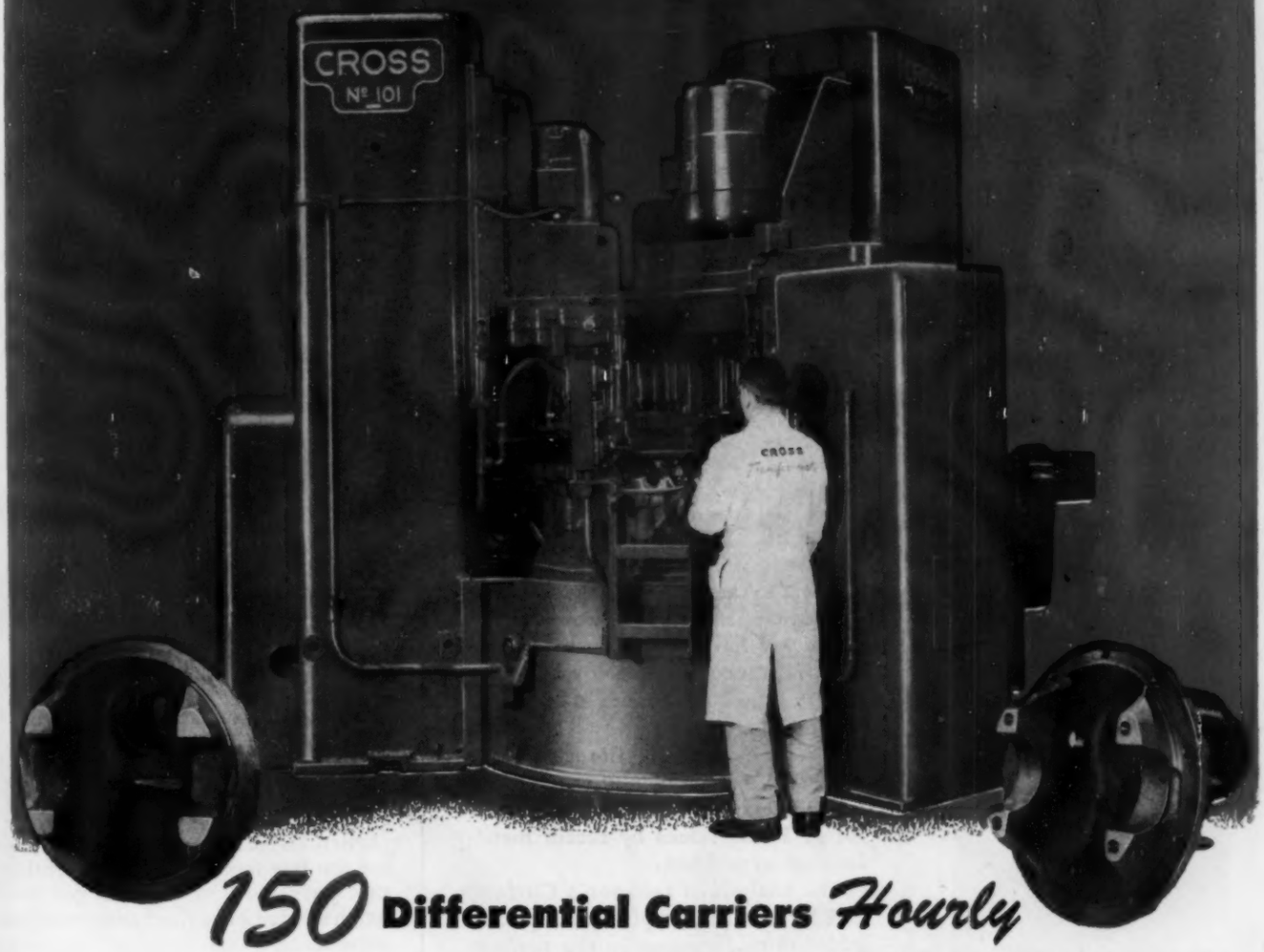


GEAR variable-speed changer, the H-6 unit, is rated 20 hp. for speed-variation ratios of 5 to 1 and 6 to 1, and 25 hp. for speed-change ratios of 2 to 1, 3 to 1 and 4 to 1. Made by Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., the P.I.V. gear unit is made only in a plain, basic Type No. 1 horizontal assembly with housing split horizontally

Flow Sight SFX by Oil-Rite Comes in Three Body Sizes

A flow sight, Style SFX, as a companion to their sight feed valves, is manufactured by Oil-Rite Corp., 3486 S. 13th St., Milwaukee 7, Wis. Flow sights are used for gravity- or pressure-fed lines with flow of liquid downward through a nozzle on the inlet side. The round stream observed is discharged without contacting the transparent sight. Flow control can be obtained by adding a regular globe, angle, or gate valve.

Another Special Machine by Cross



150 Differential Carriers *Hourly*

The many advantages of custom-made machine tools in improving operator productivity and lowering cost per piece are well illustrated by this new machine. Before designing such machines, Cross evaluates all factors which influence individual manufacturing—quality, quantity, operation sequence, and operator limitations. The result is a special machine tool capable of producing specific products at the lowest possible cost.

The machine illustrated above is typical of this planning.

PART: Automobile Rear Axle Differential Carrier.

OPERATION: Drill, countersink, ream 10 flange holes. Drill, countersink, tap 4 bearing cap holes. Drill, tap drain hole.

PRODUCTION: 150 pieces per hour at 80% efficiency.

EQUIPMENT: Cross Special Drilling and Tapping Machine.

FEATURES: ☆ Minimum physical and mental effort required from operator ☆ Part slides in and out of machine on rails—no lifting required ☆ Seven-station power operated index table ☆ Independent loading station ☆ 6 pieces cut at a time progressively ☆ Flexibility for part design changes through use of Cross standard columns, heads, and index table ☆ Hardened and ground steel ways ☆ Hydraulic feed for drilling, reaming, and countersinking ☆ Lead screw feed for tapping.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

THE **CROSS** COMPANY

Established 1898

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

18-8 stainless steels

WITH A

FOR YOU...

FOR 25 years or more steels with an alloy content of 18% chromium and 8% nickel have shown such remarkable resistance to corrosion that they have earned the name of "Stainless" steels.

Although basically the same, the modern, 1948 models of the "18 and 8" stainless steels have been given a lot of PLUS values by recent metallurgical experience.

The analysis of Lebanon's Circle L 22XM (left) is a typical example. In addition to increases in the percentages of chromium and nickel, approximately 2.25% of molybdenum is added. It enhances the general corrosion resistance to many chemicals and is an important PLUS value to many manufacturers—perhaps to you.

If corrosion is one of your troubles, your metallurgists and design engineers should have a complete file of the new Lebanon Data Sheets describing these alloys. Write for them today.

LEBANON CIRCLE L 22XM

NOMINAL ANALYSIS

Carbon Max.	0.07
Silicon	1.25
Manganese	0.75
Chromium	19.50
Nickel	10.00
Molybdenum	2.25

NOMINAL PHYSICAL PROPERTIES

Tensile Strength	82,000
Yield Point	42,000
Elongation in 2"—%	50
Brinell Hardness	160

LEBANON STEEL FOUNDRY • LEBANON, PA.
"In The Lebanon Valley"
ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

LEBANON ALLOY AND STEEL Castings

L

ROUND TABLE Discussion

STUDY IT OR DO IT?

I certainly agree that no one can learn the shop in thirty days—even with a B.S.M.E. degree.

I feel that education cannot be neglected, although learning the hard way may be necessary if one cannot afford a college education. However, with the benefits of a college education, a man has been trained to think faster, plan his work better and to grasp his job in a shorter time.

Men without formal education, particularly college degrees, that get to the top grow fewer each year. The reason is that top executives are now becoming college-minded and look for men having degrees in the field in which they are to work.

It becomes the problem of how to get the two extremes together. How can a man get the needed book learning and the actual experience during the years of his life when he can best apply himself and absorb both phases? We all know that the younger a man is, the more easily he learns, the more readily he can concentrate on any one subject . . . particularly a new one. So it is during the late teens and early twenties that boys are best fitted to get this much needed education and practical experience.

If one really wants to apply this principle of learning and of getting practical working experience at one and the same time, he needs only to choose one of the several excellent cooperative universities in this country. Here the young student has a chance to learn technical data and then apply this knowledge while still attending college by actually working in shops and businesses where a cooperative relationship has been established between the college and the manufacturing company. The young man, while still an undergraduate, learns what it means to be thrown into contact with older men. He has a chance to learn on machines — not wholly from models at college — and to learn how they operate and why it is necessary to do certain operations in a certain way, etc. He stands to benefit from the "old-timer's" practical experience (providing he doesn't play the smart-aleck). When he returns to college after such a working session,

These Threads are too shallow

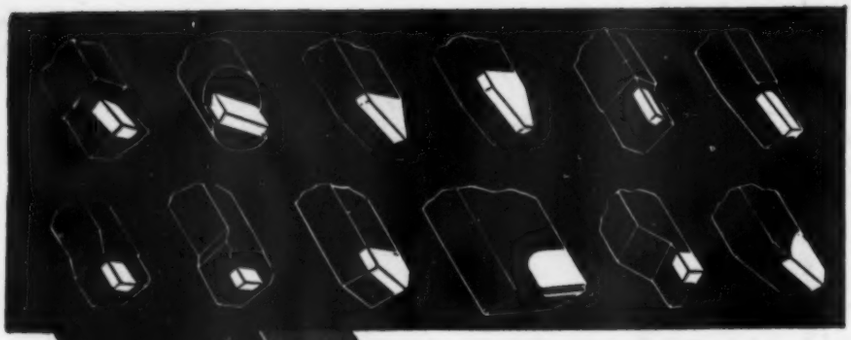
These Threads are too deep

These Threads are just right

Circle Ⓑ Bolts and Nuts . . . both standard and special . . . are noted for their uniform size and strength. They keep production lines moving with top efficiency.

BUFFALO BOLT COMPANY
North Tonawanda, N. Y.
SALES OFFICES IN PRINCIPAL CITIES
Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

. . . they are CIRCLE Ⓑ BOLTS



Wendt-Sonis Standard Carbide Tools are available in a wide variety of types and sizes.

for COST CUTTING . . .

. . . on CUTTING JOBS

- *13 standard Wendt-Sonis carbide tipped tools will perform over 80% of a plant's tool bit operations.*
- *Wendt-Sonis standard tool bits can be supplied with any grade of carbide required.*
- *Standard Wendt-Sonis tool bits are stocked in Carboloy and Kennametal grades of carbide for universal machining operations.*
- *Nationwide sales and service organization of established W-S distributors stocks a complete line of W-S standard products.*

W-S standard tool bits are "Color Marked" for easy identification as to use on steel or non-ferrous materials. All shanks are rust resistant — also heat-treated for greater rigidity. Cutting edges are diamond ground for longer wear and better finish. Use W-S carbide tools to increase your production . . . combat rising costs!

Free! NEW CHIP-BREAKER CHART

Contains illustrations of chip-breakers, grinding instructions, and recommendations for their use. Chart size — with handy tab for wall hanging. To get FREE chart WRITE: Wendt-Sonis Company, Hannibal, Missouri or 580 N. Prairie Ave., Hawthorne, Calif.; 1361 West Lake St., Chicago, Illinois — Warehousing Facilities: Eastern Carbide Corp., 909 Main St., New Rochelle, N. Y.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

he can discuss his findings and expand his knowledge of the business world as it fits in with his textbook learning.

Upon graduation he knows what to expect from industry. He knows how to operate equipment, meet people, work with men less educated than himself and he has learned a respect for their practical knowledge. All of this will carry weight with an employment office.

Standard college training does not give this broad background. Too often, the college graduate enters the employment office with a superiority complex, feeling that his college degree is an "open sesame" to the top-ranking job and an office with his name on the door. It is true that these are often the colleges with the big-name football teams, but can a football team run your machine shop? I doubt it. You really want a man who can face the world without getting rebuffed. Your son can get his education and his experience at the college or university that operates on the cooperative plan. Don't be like Ed and make your boy learn the hard way . . . give him the double advantage of practical experience AND education.

Charles D. Townsend
Centralia, Mo.

●

GUARDS OR PRODUCTION?

It seems to me that Ed is on the wrong side of the fence when he objects to having a sufficient number of guards installed on a machine because it would retard production.

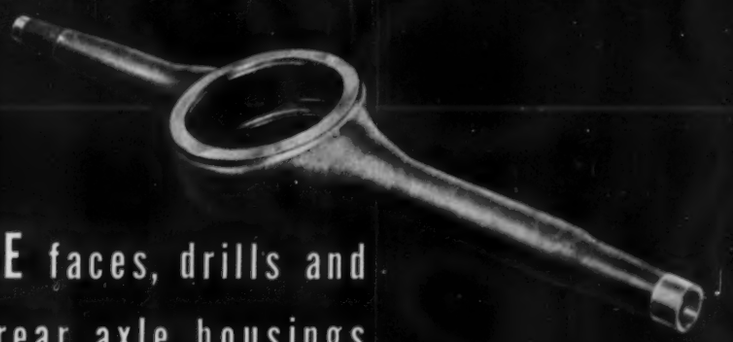
His argument is based on fallacious reasoning, since it would be the other way around. Production would be increased because there would be no lost time due to accidental injury.

Because Ed's men are adults, he thinks this is sufficient reason to discard certain safety appliances, but accidents can occur in any age bracket.

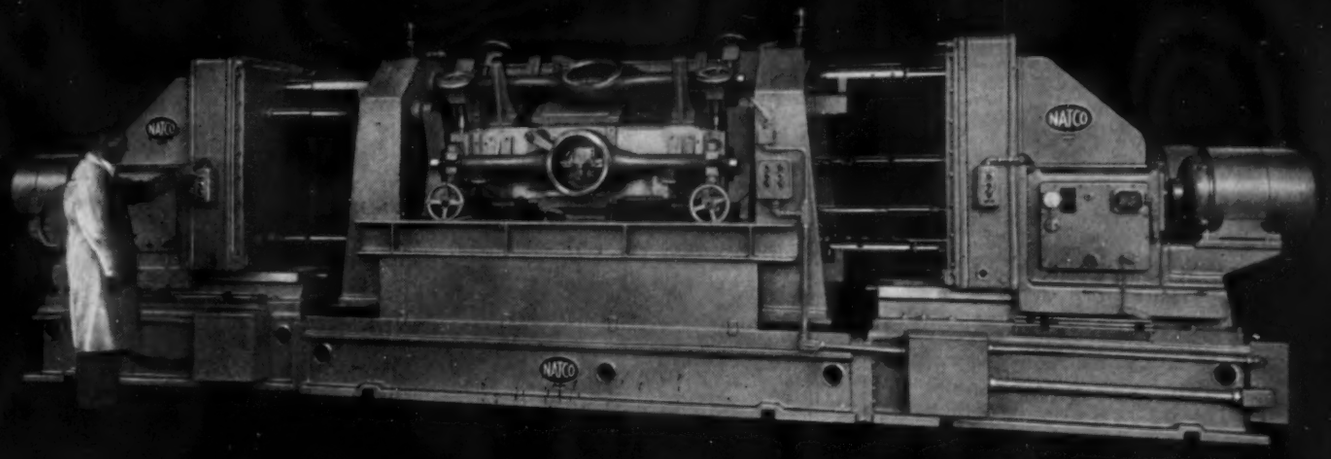
The safety man is aware of what accidents are likely to happen, and it is his duty to forestall this eventuality, thereby benefitting both employer and employee.

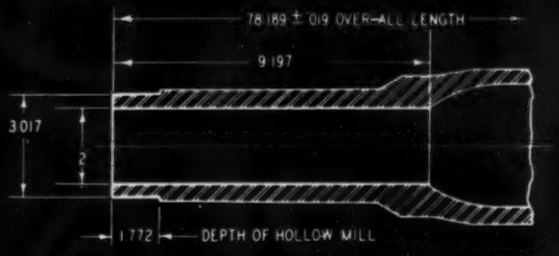
It is quite true that injuries can be avoided even though safety guards are absent, but this implies constant vigilance when the machine is in operation. However, so many factors can momentarily distract a worker's mind that only a second's inattention could result in a serious accident. This is the precise moment when the guards are of value; and a wise worker will be grateful for

75 rear axle housings per hour



NATCO HOLEUNIT MACHINE faces, drills and hollow mills both ends of rear axle housings





SECTION OF ONE END OF REAR AXLE HOUSING SHOWING DIMENSIONS OF FINISHED HOLE, AS FACED CORE DRILLED AND HOLLOW MILLED

POSITION 1 Remove and load one part.
POSITION 2 Front Right and Left Hand Heads — Face both ends.
POSITION 3 Rear Right and Left Hand Heads — Core drill holes ⅓ depth.
POSITION 4 Rear Right and Left Hand Heads — Core drill holes ⅔ depth.
POSITION 5 Rear Right and Left Hand Heads — Core drill holes through.
POSITION 6 Front Right and Left Hand Heads — Hollow mill both ends to depth.

This NATCO two-way, four-headed, horizontal drilling machine with hydraulic feed combines multiplicity of operation and high production. The machine consists of four E21 HOLEUNITS and a total of ten spindles. A NATCO six position trunnion-type fixture accommodates one rear axle housing in each position while performing the operations outlined under the drawing at the left. The part is located by equalizing at each end and in the banjo housing. Production, including facing, step core drilling and hollow milling both ends of each axle housing, is 75 parts per hour.

NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

NATCO

Call a Natco Field Engineer

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

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HOW LONG-

SINCE YOU'VE WRITTEN OFF YOUR OLD DRILLING MACHINES?

MODEL C-20 SIBLEY
20" SWING DRILLING MACHINE

Many manufacturers are still operating old drilling machines whose costs were written off years ago. Now obsolete in speed, accuracy and operator efficiency, they are a decided handicap in paring costs to offset higher labor rates.

Cost Savings Can Be Made!

The new model C-20 Sibley will furnish you savings on cost per piece by—

1. Increased operator efficiency and output.
2. Greater speed and power.
3. Finer accuracy.

Install a new model C-20 in your plant and make a Time and Motion Study comparison with your present drilling equipment. It will demonstrate the advantages of such features as easy access to controls—where you turn a knob to select the proper geared power feed; convenient shifting of V-belt; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M. powered by a 2 H.P. motor.

GET COMPLETE INFORMATION ON THE SIBLEY MODEL C-20

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them, using them when an operation calls for it, for he knows the consequence if no guard is used and a slip occurs.

Milton E. Sussman
Brooklyn, New York

•

A machine operator must accept some responsibility for his conduct toward machinery, which is made for the movement of its various parts in ways suitable to do its work. The cutting member, whether it be a cutting tool or a grinding or polishing wheel, in many cases cannot well be covered and must be dealt with the way the hunter regards his gun — that is by keeping clear of its muzzle.

In most cases proper guards can be applied to machine tools that will protect the operator and not delay production, but to accomplish this requires a very carefully designed guard; however, cases do occur where it seems to be impossible to provide an efficient guard that will not interfere to some extent with production.

Chips, too, are an increasing problem, as cutting speeds and feeds are ever increasing. However, this is one that can be cared for with proper, well-designed equipment. A reasonable amount of production should be endured to give the operator thorough protection.

There is a tendency among men to take chances. This should be discouraged in every way possible.

On jobs where there are some risks that cannot be avoided, it is well to have a warning notice to go along with the tooling equipment for the job, to be placed at a spot in plain view of the operator which explains the best way of procedure on that job with the least risk to the operator.

Abel Blakeman
Watervliet, N. Y.

•

IS TOO GOOD TOO BAD?

The fact that a man wants to get ahead doesn't push him in that direction unless he has the necessary qualifications. The foreman should be able to separate his workers into three classes: those who want to get ahead, those who are satisfied with their present work, and those who like variety, but aren't interested in getting ahead. When he has his men typed, he should see that those who want to get ahead are given the proper training and every possible advantage. The specialist should also be trained to become more efficient in his tasks, and the jack-of-all-trades permitted to han-

NEVER A DULL MOMENT

when you machine THE FIRTHITE way

CONDITIONS

72" Boring Mill
Boring Cast Steel Gear Teeth
Feed — 0.016" per revolution
Cut — 3/8"
Speed — 175 feet per minute
Grade of Carbide — Firthite TO4

Firthite tools stay sharp longer
even on this severely interrupted cut
which might break ordinary carbide tools.
Let us help you select the best Firthite grade for your "Problem Job."

Call Firth Sterling

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WITH THE

CIRCULARITY-GRINDING ATTACHMENT

for

- ★ Form Relief — Radial Relief — Form and Radial together — Straight and Tapered Cylindrical Grinding
- ★ Easily mounted on all Universal and Cutter Grinders
- ★ Work held between dead centers or in collet
- ★ No special cams or fixtures needed for any set-up

DEVELOPED by the Detroit Reamer & Tool Company, the Circularity-Grinding Attachment has been used successfully for several years in the manufacture and reworking of cutting tools. Form relief, radial relief, form and radial relief together, straight and tapered cylindrical work all may be accurately ground with this attachment . . . thus in many cases it replaces a motor-driven headstock.

The work may be held in a collet (0" to 1¼") or between dead centers. In either case the work always revolves on its own axial center. Set-ups are simple and the Circularity-Grinding Attachment provides identical relief on every tool ground from the same set-up.

Send for our new illustrated bulletin which gives complete explanation of set-up and operation of the Attachment. Write today.

D&T COMPANY

DETROIT REAMER & TOOL CO.

Mfrs. of Special High Speed Cutting Tools

2830 East 7 Mile Rd. Detroit 12, Michigan

dle everything his capacity will allow.

It is the foreman's lot to guide his men, but he cannot change their psychological inclinations. There are some men who are constantly trying to improve, but lack certain qualifications; who may be ambitious, but lack personality, knowledge, etc. The specialist might have the qualifications, but he may not have the desire to advance.

There are many plants which have supervisors who were second-best choice because the best man spurned the offer to advance.

The men in the third group are the most common. Some of them later become specialists, others advance, but the majority stay in that class. To place a man in a position he does not desire can harm both the company and himself. There are some men who hesitate because they do not know if they have the qualifications, but after given a try, find they can carry the load. The war brought about the development of many successful men in positions, industries, and professions which they would never have entered under normal conditions.

Frank J. Zarnowski
Rutherford, N. J.

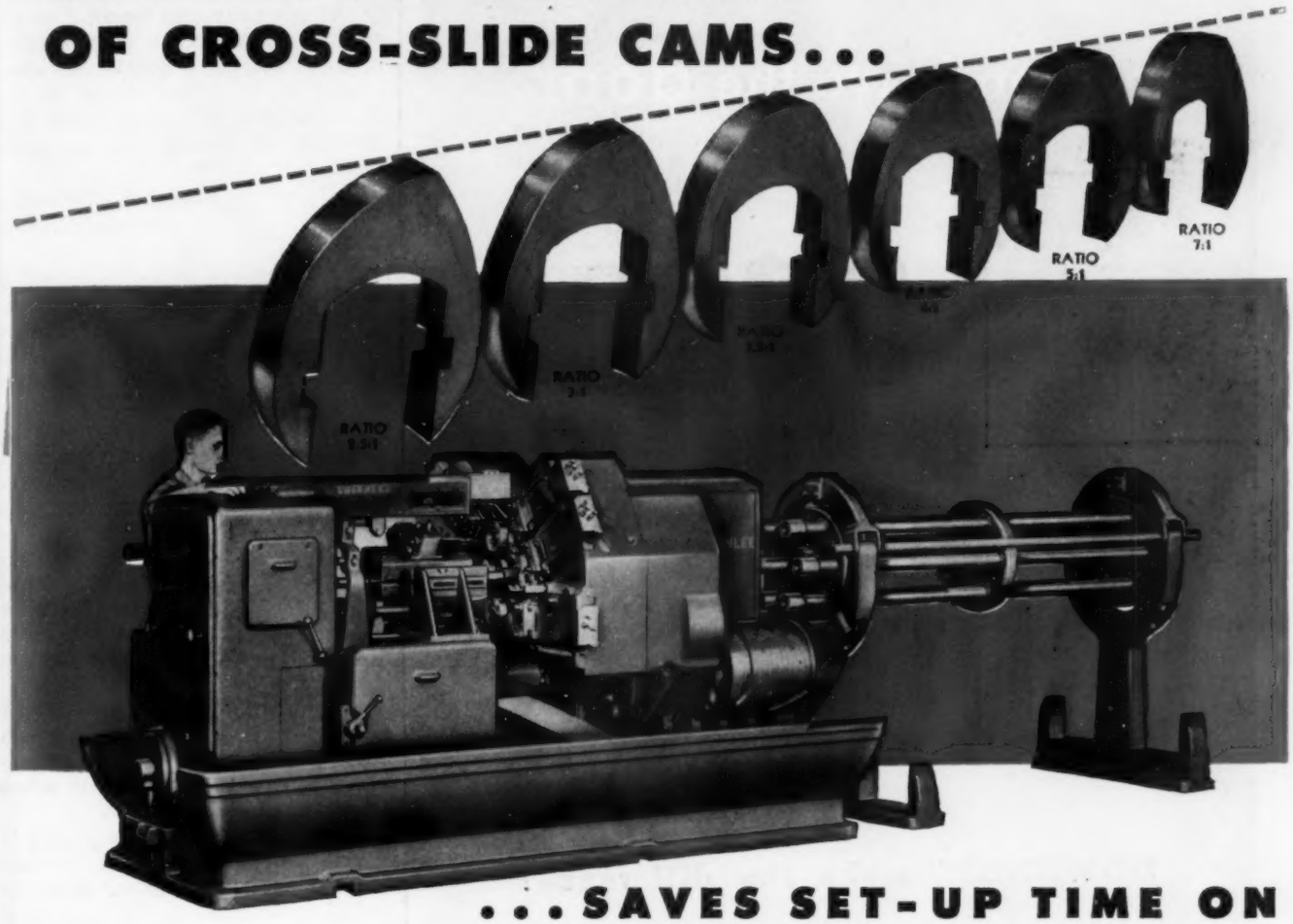
•

There is no doubt that many a good man has missed his chance to get up in the world because some selfish foreman didn't want to "break in" a new man to take his place on the machine or operation where he had demonstrated ability. This type of foreman not only did the man an injustice—he also deprived the company of a chance to utilize the man's potential more profitably. I know of one such case where the man concerned found out why he had been passed over for promotion and promptly packed up his tools. An interesting sequel to this story is that some time later he chanced to meet the superintendent of the shop he had left and in the course of the conversation mentioned his reason for quitting, which was news to the "super." It later turned out to be bad news for the foreman concerned.

On the other hand, there are many first-class workmen who are quite content to remain at the machine or bench and actually resent being moved around, although the move may offer an increase in salary. The wise foreman is he who recognizes this type of individual and values him accordingly.

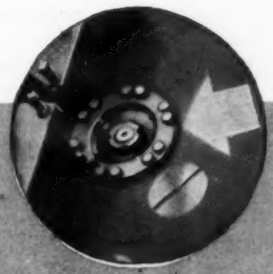
As a general rule, however, it pays to have men in the shop who are willing and able to tackle any machine or operation. In nine cases

UNIFORM HIGH POINT OF CROSS-SLIDE CAMS...



...SAVES SET-UP TIME ON GREENLEE "6" AUTOMATIC SCREW MACHINE

No matter what ratio cross-slide cam you select, the high point is always the same distance from the center of the cam shaft. This means that cams can be changed at will after cross-slide feed adjustments have been made *without having to re-adjust tools or holders.* When trying out a set-up for best rates of cross feeds, this GREENLEE feature provides an obvious and substantial saving in time.



COMPENSATING STOPS SET AT FACTORY AND SELDOM NEED RESETTING

Compensating wheels (see above) carry adjustable hardened steel stop buttons and index in unison with the spindle carrier. Each button is locked to limit the travel of a given cross-slide to correspond with spindle position. All buttons are set at the factory and seldom require adjustment. This GREENLEE feature insures accuracy and uniform production at all spindle positions.

CROSS-SLIDES INDEPENDENTLY OPERATED

On the GREENLEE "6", each cross-slide has its own individual feed cam, so the feed rate of each slide can be set independently of any other. This affords maximum set-up flexibility, and permits selection of the best feed rate for each cross-slide tool. Cams are standardized and designed to provide a range of cross feed rates which are in simple fractional relation to the main tool slide feed rate. Cams are fully interchangeable — any cross-slide cam can be used on any cross-slide—thus effecting a substantial saving in cam expense.

Send for Literature

Write today for Booklet and Circular giving full information on all GREENLEE features and describing the advantages of the new Lead-Screw Feed for heavy-duty precision threading. Learn why the Greenlee "6" is often called "The Operator's Favorite".

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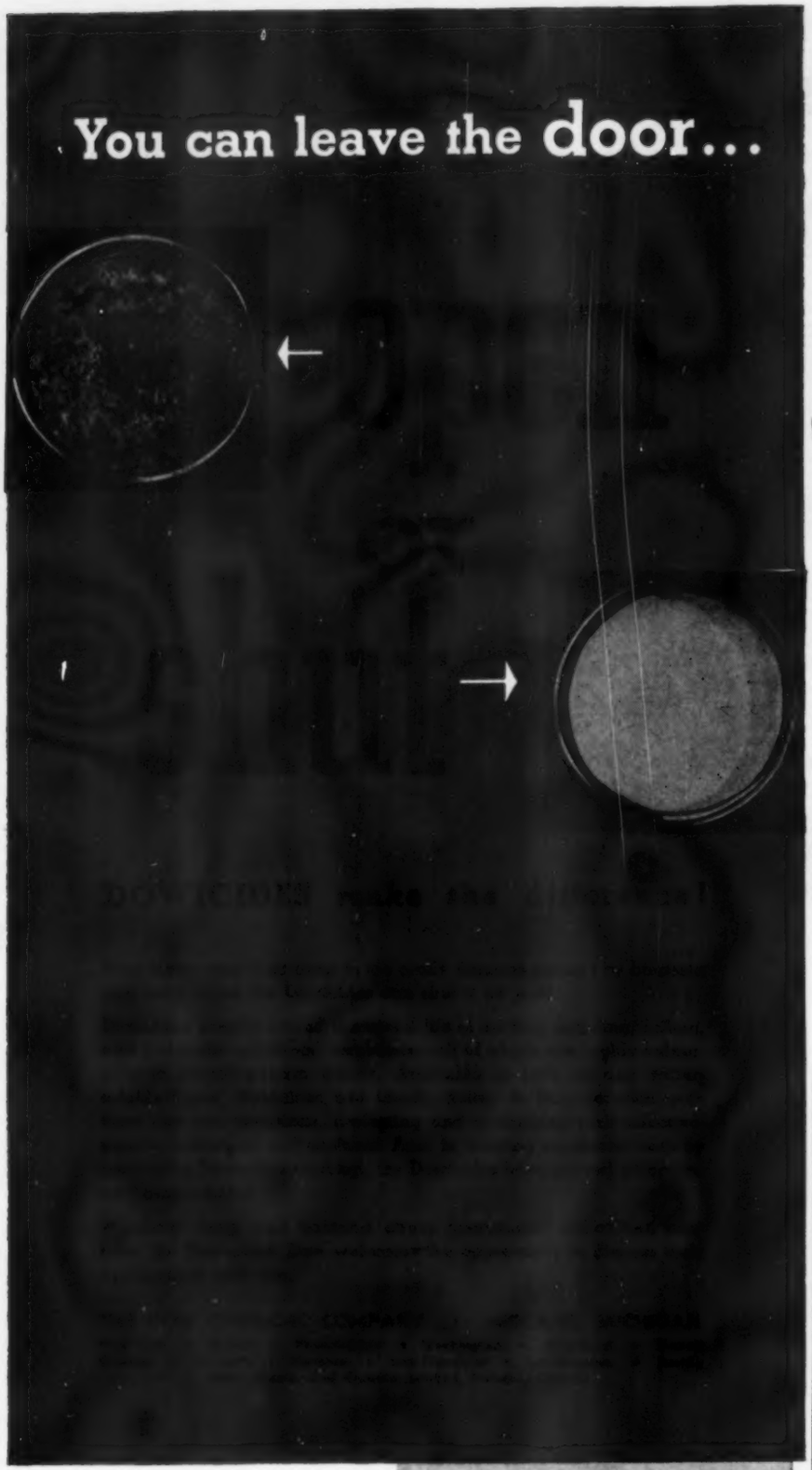
MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



DOWICIDES

germicides and fungicides

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

out of ten, the try-anything-once individual will be more of an asset to the company and because of his willingness to accept responsibility is most likely to be considered when promotion is in the offing. In the final analysis, it all boils down to a question of employment temperament.

Robert S. Alexander
Greenville, R. I.

•

Every employee in an organization should learn by practice and observation that he is most valuable to both his empoyer and himself if he makes himself capable of holding a job above his present position.

Ideal progress should be step by step until he has reached the plane equal to his ability in education, skill and manner of mingling with others.

However, the desire and ability to travel along such a road is found in only a few employees, therefore for various reasons most will reach their greatest usefulness at various stages along the way.

Employers, whether it meets their ideals or not, are forced to use employees profitably. That means advancement can only be made where it can be done profitably.

Quite a few employees prefer to develop along some certain line and become specialists rather than developing themselves in a general way. In such cases, they choose the particular groove where they fit best and remain there in satisfaction to all concerned.

John Mark May
Watervliet, N. Y.

•

DOES A RAISE RAISE OUTPUT?

When a raise in wages is given to meet the general raise in the price of commodities, such a raise is likely to be looked upon by the worker as an overdue realization of general conditions and is not usually accompanied by a raise in output; in fact, there is more often a loss in output, as workers in general receive more money, and this has a tendency to increase the amount of lost time.

These are the conditions today and are responsible to a great extent for present unrest and for the lower percentage of production in proportion to working hours.

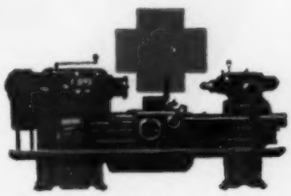
In most cases, the worker finds that he can find employment in a line he understands and in which he has the greatest skill. In such an instance, a man is most likely to be contented and will prove to be of the greatest value to his employer in both quantity- and quality-produc-

AXELSON FIRST CHOICE

MASTER MACHINISTS AGREE... there is no finer engine lathe than an AXELSON. Designed by men who are themselves master toolmakers, AXELSON lathes embody every feature that contributes to faster production, more accurate work, easier and safer operation, and maximum versatility.

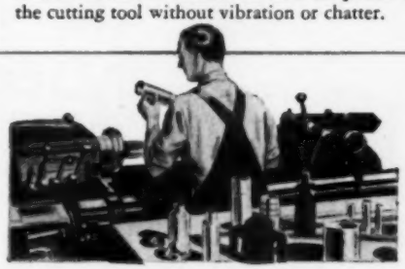
THE "FEEL" OF PERFECTION... is immediately apparent the first time a machinist puts the tool to the work in an AXELSON lathe. Velvet smooth control action... Continuous flow of power at the cutting tool without vibration or chatter.

THE TOOL CARRIES THROUGH... with precision accuracy from the beginning to the end of each cut. Massive construction throughout to maintain absolute alignment... Perfectly mated bearing surfaces on slides and ways... Heavy duty anti-friction bearings... Hardened and ground alloy steel gears... Rugged headstock, apron, tailstock, and gear cases.

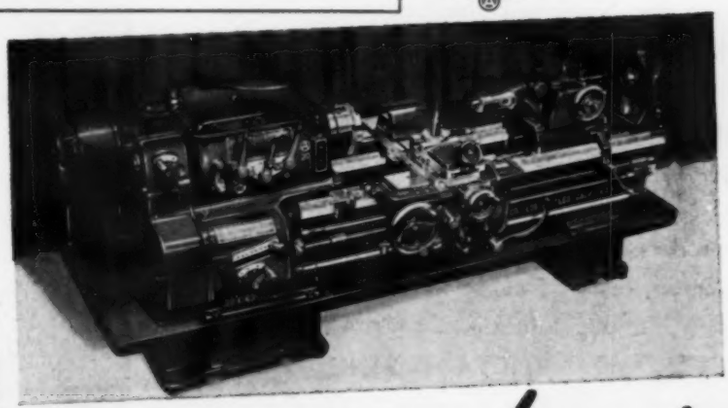


BUILT-IN SAFETY... protects operator from injury, tools from breakage, and work from the reject bin. Handwheels, levers, and other controls located within easy sight and reach of operator... Extreme rigidity and absence of backlash protect costly cutting tools... Positive automatic force-feed lubrication to gears, bearings and ways preserves original precision accuracy.

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY



PRACTICAL VERSATILITY... permits a wide variety of operations with all types of tools, on any kind of stock... Two-speed tailstock... Wide range of feeds and speeds instantly available... Ram type turret, power rapid traverse, micrometer carriage stops, relieving and taper attachments, and many other accessories available for added versatility.



AXELSON *Lathes*

DEPENDABLE FOR A THIRD OF A CENTURY

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LOS ANGELES 11 • NEW YORK 7 • ST. LOUIS 16

Authorized Distributors in All Principal Industrial Centers

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TO PLANT EXECUTIVES
Complete illustrated descriptive literature tells the story of Axelson's Lathes. Write today on your company's stationery.

One kind of
MARKING
this machine won't do

Quite frankly we do not intend to "mechanize" the above marking operation. We doubt that any machine would give as much satisfaction as the old-fashioned method. But the Noblewest Model 279, illustrated, does mark the case of the lipstick used by the young lady who left her mark. And more important to you is the fact that this addition to the Noblewest line can be tooled for marking a large variety of products in metal, plastic, hard rubber, wood, etc. Employs the famed Noblewest roll marking process. The inscription (including the delicate decorative design) is permanently rolled in—lasts as long as the product itself. You, too, can mark your products faster, better, cheaper with Noblewest Production Marking Equipment. Write NOBLE & WESTBROOK MANUFACTURING CO., 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

tion. With this type of worker, a raise in wages raises output.

There are occasional cases where the worker is faced with home expenses which he has difficulty in meeting and feels forced to accept work that will bring him the most money regardless of whether the work is to his liking or the kind in which he is most skilled. In such cases a raise in salary may not raise output.

The greatest incentive for efficiency is good equipment and comfortable surroundings in which the operator is made to feel that his work is appreciated.

Abel Blakeman
Watervliet, N. Y.

"Quotes"

Storeroom Planning

A. C. Farley, superintendent of warehousing and shipping, Davison Chemical Corp., brought out, at the 1948 National Materials Handling Exposition conference, the factors to be considered in planning a storeroom operation.

"Whenever plans," he said, "are made to establish a system for a storeroom, it must be remembered that there are three A's in the handling of supplies the same as there are three R's in education:

A for availability
A for accessibility
A for accountability

"To satisfy the three A's of supply, certain conditions must be met throughout the cycle of receipt, issue and storage operations. If individual containers or issue units are properly marked and stored so each separate item in stock is directly accessible to issue and inventory, accurate inventories will automatically result.

"It is the second A—accessibility—which we are interested in when we talk of storage. The actual warehousing of supplies is nothing but the continuation of a receiving operation and a preparation for the issuing operation. Good storage not only warehouses supplies with a maximum utilization of space, a maximum conservation of time and labor, and maximum protection to supplies and the safety to stock clerks, but insures that the supplies may be issued with the same efficiency, safety and above all—speed."

CRESCENT PALLETIER FORK TRUCK

DEPENDABLE

POWER

EXIDE-IRONCLAD BATTERIES assure sustained speed throughout each shift . . .

From a fully charged condition until almost complete discharge, Exide-Ironclad Batteries maintain a high voltage . . . assuring steady, uniform performance all day long. This full shift availability of Exide-Ironclad Batteries is a result of their unique construction, which differs from all other batteries.

One important difference is the positive plate, which consists of a series of slotted tubes containing the active material. So fine are these slots that, while permitting easy access of the electrolyte, they retard the active material from readily washing out. The results are *high power ability, high electrical efficiency, ruggedness* and *long life* . . . the four characteristics of a storage battery. Only Exide-Ironclad Batteries have all four.

For safe, dependable, day-in-day-out performance, choose Exide-Ironclad Batteries, the batteries that 81.1%* of electrical industrial truck owners prefer. **From a recent survey by a leading business publication.*

Write for further particulars and FREE copy of Exide-Ironclad Topics, which covers latest developments in material handling and shows actual case histories.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

CRESCENT PALLETIER FORK TRUCK

OUT OUR WAY

THIS ONE SAYS THAT IT'S JUST AS GOOD AS SOL-SPEEDI-DRI-- AND IT'S A QUARTER OF A CENT PER POUND CHEAPER!
DON'T GIVE ME THAT! THERE AIN'T ANYTHING AS GOOD AS SOL-SPEEDI-DRI! AND I'D PAY A QUARTER OF A CENT A POUND MORE ANY DAY TO BE SURE I'M GETTING MY MONEY'S WORTH! DON'T COME IN HERE AGAIN WITH THAT "JUST AS GOOD" STUFF! WE'RE STICKING TO SOL-SPEEDI-DRI!
STILL AN OLD MAIN STREET BOY -- STILL BELIEVES IN GETTING THE BEST FOR THE JOB--NOW YOU SEE WHY HE'S THE BOSS!
TELLIN' 'EM OFF
J.R.WILLIAMS
T. M. REG. U. S. PAT. OFF. COPR. 1948 BY NEA SERVICE, INC.

Be Safe . . . Be Sure . . . Use SOL-SPEEDI-DRI

People who use SOL-SPEEDI-DRI—industry's original and foremost absorbent for all liquids—have learned that they can count on the uniformly high quality of SOL-SPEEDI-DRI. They have learned, too, that SOL-SPEEDI-DRI costs *less* because it does *more* work . . . because it is always efficient, always dependable.

Yes, it's quality all the way with SOL-SPEEDI-DRI . . . quality that assures you cleaner, brighter, safer floors . . . freedom from slips and falls caused by dangerous, slippery surfaces. Obtained by selective mining, laboratory-checked hourly, and processed by the most modern methods and equipment, SOL-SPEEDI-DRI comes to you in special weatherproof bags, *every* pound at peak efficiency. Remember the name . . . SOL-SPEEDI-DRI!

WHEN YOU BUY, BE *SURE* IT'S SOL-SPEEDI-DRI!

Safety and Maintenance Co., Inc., No. 1 Wall St., New York 5, N.Y.

Warehouse Stocks Maintained in Principal Cities of the United States and Canada

An Engineer Speaks

G. C. Landis, vice president and chief engineer, The Lincoln Electric Co., called for greater cooperation between design and tooling in a panel discussion at the 1947 annual ASME meeting. He claimed:

"The artificial barrier which has grown up between the engineering department and the production departments has done more than any other one thing to retard the continual reduction of costs which is so essential to profitable manufacture. The engineer has too often assumed the position of a little tin god who speaks a strange language and whose word is law. The attitude has never been well received by the man in the shop.

"If the engineer could design a product having the highest standard of performance, using materials of the lowest cost and greatest availability, put together in a manner which required the least labor and the least expenditure for tools, this setup might work. He is not that smart.

"If we are to manufacture intelligently we must think of when who does what rather than think of these various functions as being subordinate to the organizational setup. This means that an attempt must be made to get all the brains into the design of the product before the design has been put on paper. This is important because a blueprint has a sense of finality about it which, though had to explain, nevertheless exists."

•

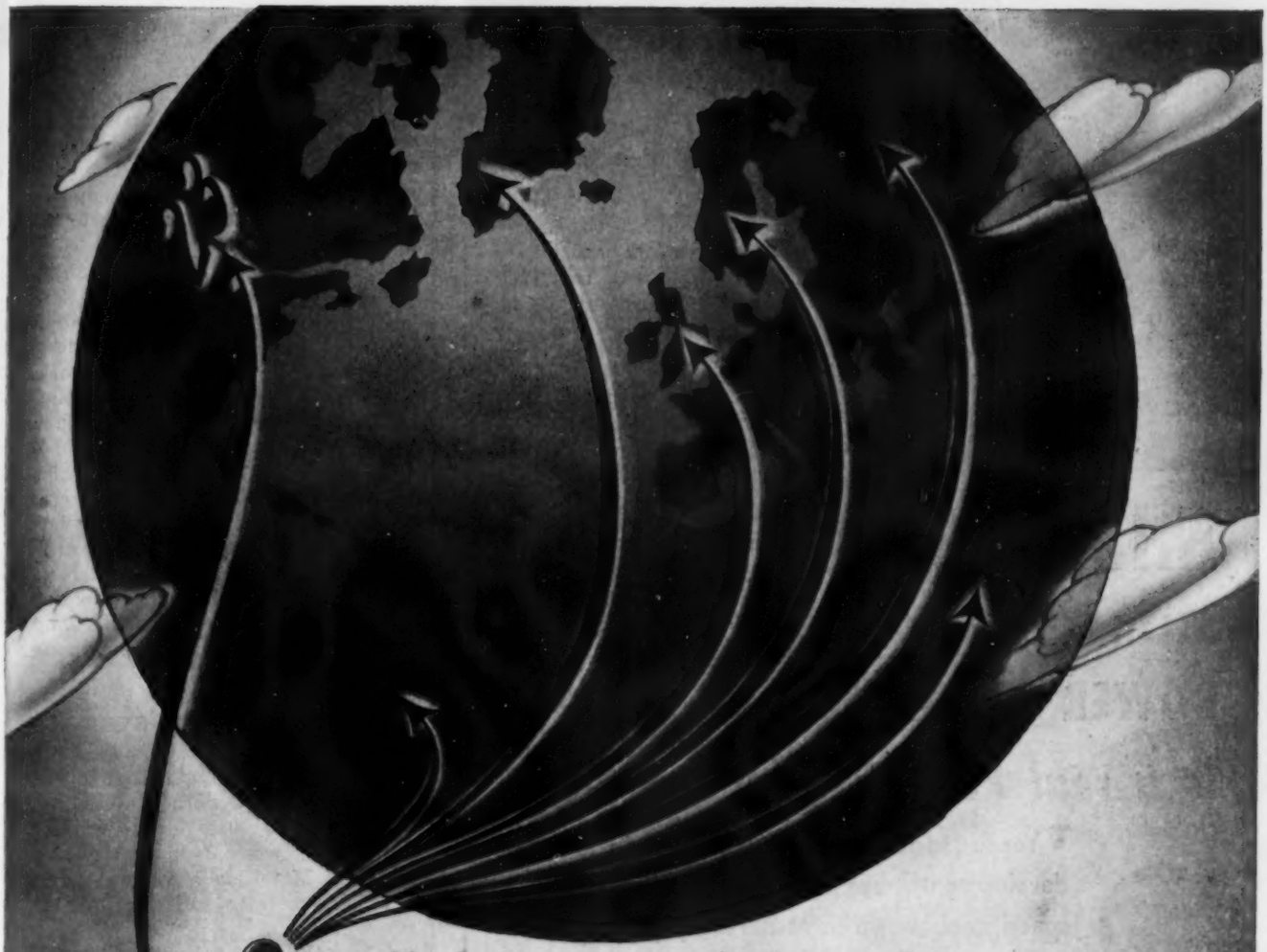
Words on Selling

Ezra W. Clark, materials-handling consultant, keynoted the conference held concurrently with the 1948 National Materials Handling Exposition. He spoke on selling, but his words are as true for mousetraps as for materials-handling equipment.

"There are," Clark said, "two sides to selling: the successful and the unsuccessful. Most unsuccessful salesmen dig their own graves. The successful sale is often built on an analysis of a man's own failure. Do not blame the prospect if you do not make a sale. Blame yourself.

"When you leave an interview, analyze the results while the interview is still fresh in your mind. Determine the causes of success or failure. Use the lessons in future calls. Most successes are built out of failures carefully analyzed.

"Many selling failures are caused by men going in to sell who do not have a clear concept as to the object of the call. He goes in, knocks



In all these parts of the world...
people save scraps of material things

But here...people save *TIME*

In industry, particularly, the secret of success is to save time. That is why more and more manufacturers are making use of Radiac 23 Process wheels for their grinding operations.

23 PROCESS MEANS:

Longer life . . . fewer wheel changes . . . . . *TIME SAVED*
Higher efficiency . . . . . *TIME SAVED*
Faster operating . . . quicker cutting . . . . . *TIME SAVED*
Dressing reduced to an absolute minimum . . . . . *TIME SAVED*

For all those whose problem it is to save time on their grinding operations there is one answer—23 Process Radiac Grinding Wheels.

A. P. de Sanno & Son Inc. **PHOENIXVILLE, PENNA.**

NOW made of
M-2
HIGH SPEED
STEEL
MILFORD
HIGH CLASS SPEED STEEL
REZISTOR
MILFORD
ALL-HARD REZISTOR
POWER BLADE
is a real Post-War blade!
Yes . . . today's REZISTOR is a post-war development . . . made from a modern high speed steel known as M-2. Newly perfected heat treatment has made possible new high cutting records.
30% GREATER ENDURANCE
The REZISTOR of 1940 was a splendid blade . . . but . . . the REZISTOR of 1948 will show far greater endurance, make more straight cuts per blade, and cut faster. Large quantities of blades, tested in our own laboratories, and on several makes of hack saw machines tell us this is true. They are our proving grounds. Your own machines are yours.
28% MORE STRAIGHT CUTS
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Saw Specialists Exclusively for Over 70 Years
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on the door, and expects the man to be in a buying mood. Time is man's priceless asset. Wasted, it cannot ever be replaced.

"We each have so many hours, weeks, months, years—the same as a general has soldiers, squads, companies, regiments, divisions. The wise general does not waste his men—the wise salesman does not waste his priceless asset of time.

"Watch your personal habits. These things are primary and fundamental, and yet I have known men worth $25,000 a year sentenced to work at half the price because they were disdainful of personal habits. Toothpicks are an abomination, just like dirty finger nails. I could tell you the story of a sales manager who failed to be vice president in charge of merchandising because he used his fork like a pitchfork. These little personal defects reflect a deficient IQ—men who live without observing the habits and customs of the best of men among whom they live."

●

SELLING A PALLET SYSTEM

John F. Roberts, staff assistant, production planning department, Ansco division, General Aniline and Film Corp., gave some potent hints, at the conference held at the 1948 National Materials Handling Exposition, on how to sell a palletizing program:

"Once the mechanics of a proposed system have been determined, the necessary capital expenditure to achieve installation must be determined. The operating costs of existing materials-handling operations must be dissected and thoroughly analyzed. Operating costs on the basis of the proposed pallet handling system must be projected.

"A comparison of existing costs with proposed costs should then be made. It is at this point that the planning engineer will be able to evaluate the system proposed, determine the savings to be realized, and decide what the possibilities for acceptance by management will be.

"The savings to be realized should be expressed as dramatically as possible in the terms most dear to the hearts of management, namely:

1. % reduction in personnel
2. % reduction in storage areas
3. $ reduction in yearly operating costs
4. % increase in operating efficiency
5. The number of years required for accrued savings to equal or exceed investment.

"In addition, intangible cost savings and additional benefits to be

THIS PRESSURE SWITCH IS *Designed* FOR MACHINE TOOL SERVICE

These Construction Features Make it a Better Pressure Switch for Machine Tool Applications

1 RANGE: Settings, externally adjustable by screw driver or an accessory metal knob, are indicated on scale.

2 DIFFERENTIAL between "cut-in" and "cut-out" pressures can easily be changed by a set-screw adjustment accessible with cover removed.

3 INDICATOR: Lever motion permits easy observation of switch action through window in cover, to assist in proper setting.

4 ENCLOSURE: Gasketed, die cast construction is oil, coolant and moisture tight. Mounting holes are sealed by cover gasket. Chained cover has self-retaining screws. Conduit hub is detachable.

5 MECHANISM: Bellows are heavy wall, seamless. Hardened parts and short travel characteristic of operating mechanism insure unusually long mechanical life.

6 CONTACTS: Heavy duty, snap action switch mechanism of self-contained type is readily removed for inspection or replacement. Separated normally open and normally closed circuits permit either direct or reverse action by choice of connection.

Covers Entire Range of Machine Tool Pressures

Nine variations of the basic pressure switch are available, any two or three of which will serve most machine builders' requirements.

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- **Lowers Costs**
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Also adapted to Blanking, Forming, Embossing, Hobbing

The die-maker machines the hardened punch or male die, then roughly saws out the female. The M & N press is then used to shear in the male punch by insertion into the female part. After filing the necessary clearance, and hardening, dies are ready for use—*in one fourth the time required by conventional methods!* The opposite procedure is used to construct the punch. Self-contained, ready to operate, the M & N press takes up minimum floor space. Capacities to 1,000 tons.

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realized by the acceptance of the proposed pallet handling system must be clearly and forcefully enumerated. Reduction in human fatigue, operational hazards to employees, damage to material, improved employee morale, reduction in time required for increased accuracy in inventory taking, more effective utilization of personnel, and compatibility with accepted practices of competitors and industry in general, are among intangible results of pallet handling installations."

SEEN and HEARD

BY JOHN GODFREY

Perishable Tools

A COMPARATIVELY new term in shop terminology is "perishable tools." Not all shops know just what the term means. In fact, all tools are perishable, although judging by some of the antedeluvian relics still in service, the owners do not seem to realize it. Some prefer the term "small tools," which seems even more unsatisfactory, as small tools may be of either class.

I wonder if we cannot borrow a term from the Navy to good advantage and call them "expendable tools." This means such tools as drills, taps, grinding wheels and a host of others which we buy and use, knowing they are being used up and must be replaced. It seems to me it is a better term than perishable tools and can leave no doubt as to what is meant.

•

Bearing Surfaces

FIBER or plastic bearing surfaces between the bed of a planer and the table may have more possibilities than appear on the surface. Machine builders of various kinds found out years ago that cast iron on cast-iron made an excellent bearing ,especially if they were kept thoroughly oiled until they attained what we used to call a "glaze" on the bearing surfaces.

An old Blaisdell lathe on which I learned the trade, or at least the lathe part of it, had cast-iron bearings on the spindle, which was of fairly soft steel. Hardened steel would probably have been better.

For the small internal-grinding attachments Pratt & Whitney used on their lathes, both spindle and

The Lyon

INTERNAL GROOVING TOOL

Its versatility saves costly preparation time — provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time — and low initial cost.

The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing an grooving problem without obligation.

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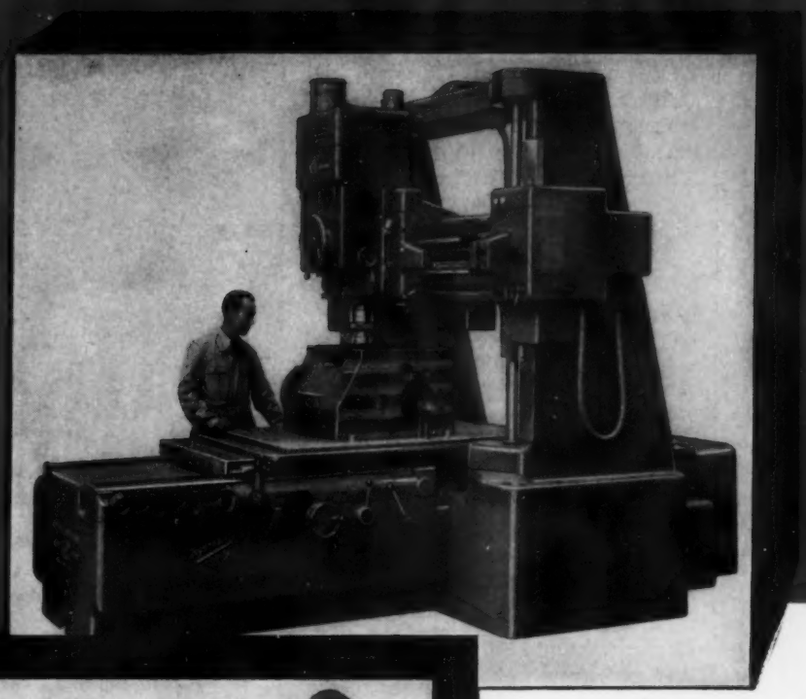
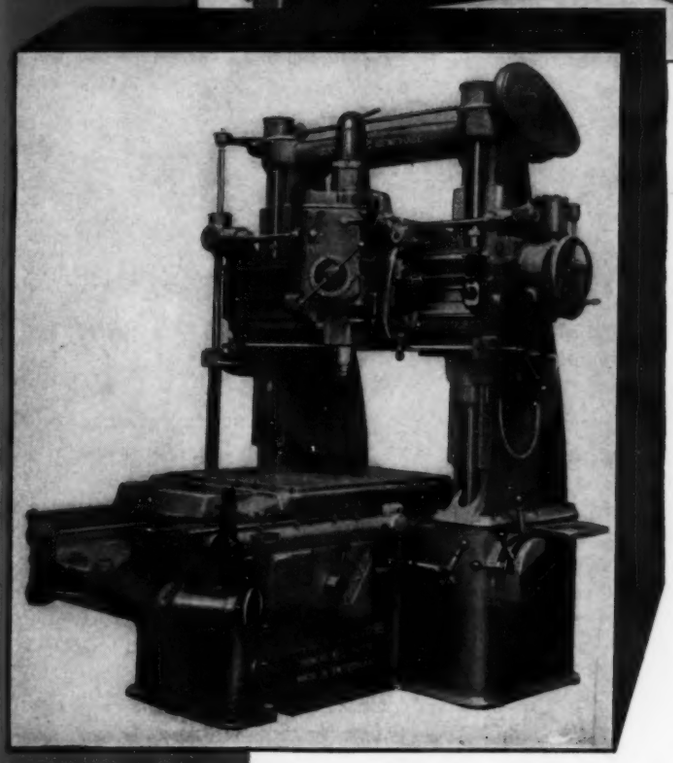


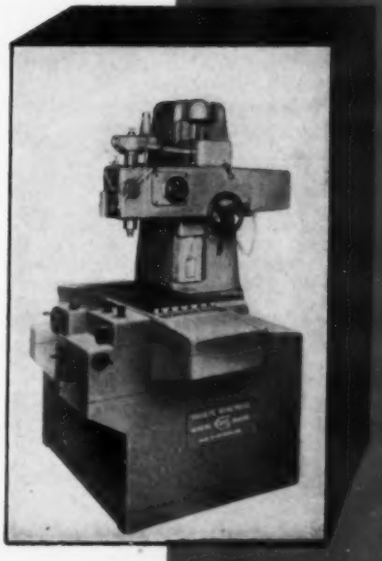
Left: HYDROPTIC–7
Table working surface 61½"x40½".
Hydraulic Table Travel.
Power Feed of Spindle for milling.
Guaranteed accuracy for all settings of Work Table and Spindle Head .0002".

Below, left: HYDROPTIC–B
Table working surface 39½"x33".
Hydraulic Table Travel.
Guaranteed accuracy for all settings of Work Table and Spindle Head .0002".

Below: HYDROPTIC MP–2H
Table working surface 27½"x21½".
Guaranteed accuracy for Table Settings .0001".



Hydroptic ACCURACY *is unusually* HIGH. . .



The unusual accuracy of the 3 types of SIP Jig Borers shown here is obtained by measurements made on SIP standard scales, graduated to within .00005". These scales are incorporated in the table slides and are read by built-in microscopes having micrometer adjustment. The entire measuring system is free from wear and mechanical stress, assuring finest precision. Write for complete mechanical specifications and performance data.

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By Thompson & Peterson

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Written by two widely experienced toolmakers, this book gives you the latest information on the methods and materials for the design and construction of all types of punches and dies for fabricating sheet metal, together with clear how-to-do-it instructions. A complete, easy-to-follow guide for the novice and a full, up-to-date handbook for tool and diemakers. Includes full reference tables and a handy summary of important facts. 254 illus. $5

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These manuals provide all the technical information needed to perform skillfully each operation on each of the major machine tools. Clear explanation of all necessary calculations, tables of data, and the precautions and "tricks of the trade" practiced by expert machinists are included. Thoroughly and clearly illustrated with large detail drawings and photographs of standard equipment in use.

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Address.....

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Company.....

bearings were of hardened steel. These bearings ran at very high speed for those days and the only lubricant they received was to wipe the spindle occasionally with a rag saturated with kerosene. They were a very close fit and did excellent work.

Some years ago, the Lukens Steel Company had Sellers make a planer with welded steel bed, uprights, cross beam and table. This saved a goodly number of pounds in reciprocating weight and elsewhere. Sellers provided cast-iron surfaces for the bearings between table and bed because they knew that the type of steel used would not make a satisfactory bearing. If we had then realized that a strip of fiber or plastic could be used between the metal surfaces, it might have been cheaper than to put in the cast-iron bearing pieces. It would be interesting to try this experiment on some of our machines and see whether we can get away from cast iron in such cases.

NEW BOOKS

MODERN MANAGEMENT PRACTICES AND PROBLEMS—*Published from papers presented at the 1947 general management conference of the American Management Association, 330 West 42nd St., New York 18, N. Y. 48 pages. Price $1.*

Treated in this bulletin are Changing Aspects of the Personnel Function in Management, by Guy B. Arthur, Jr.; Production Problems and Politics, by L. Clayton Hill; Office Organization and Personnel Trends, by I. O. Royse; New Aspects of Distribution, by A. A. Stambaugh; Financial Policy in Relation to Changing Economic and Social Conditions, by Jules I. Bogen; Changes Influencing Insurance Buying, by I. M. Carpenter; and Package Development and Merchandising, by E. A. Throckmorton.

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PRINCIPLES OF INDUSTRIAL MANAGEMENT—*By E. A. Allcut, Professor of Mechanical Engineering, University of Toronto. Published by Sir Isaac Pitman & Sons, Ltd., Toronto, Canada. 308 pages, 4th edition.*

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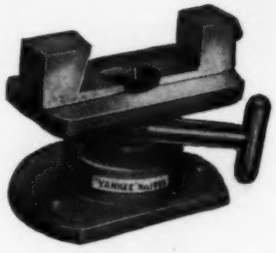

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● With a "Yankee" Vise you align the work just once, no matter how many steps the job takes. Lifts on and off a swivel base. Use it on the swivel base for bench work. When removed, it is ready for use on milling machine or drill press. Accurately machined top, bottom, sides and front end. Makes handy, economical jig. V-grooved block for round stock. Four convenient sizes of "Yankee" Vises, with or without swivel base . . . 1½", 2", 2¾" and 4" jaw widths. Your industrial distributor has them. Full details about these and other handy shop tools in the "Yankee" Tool Book. Write for it today.

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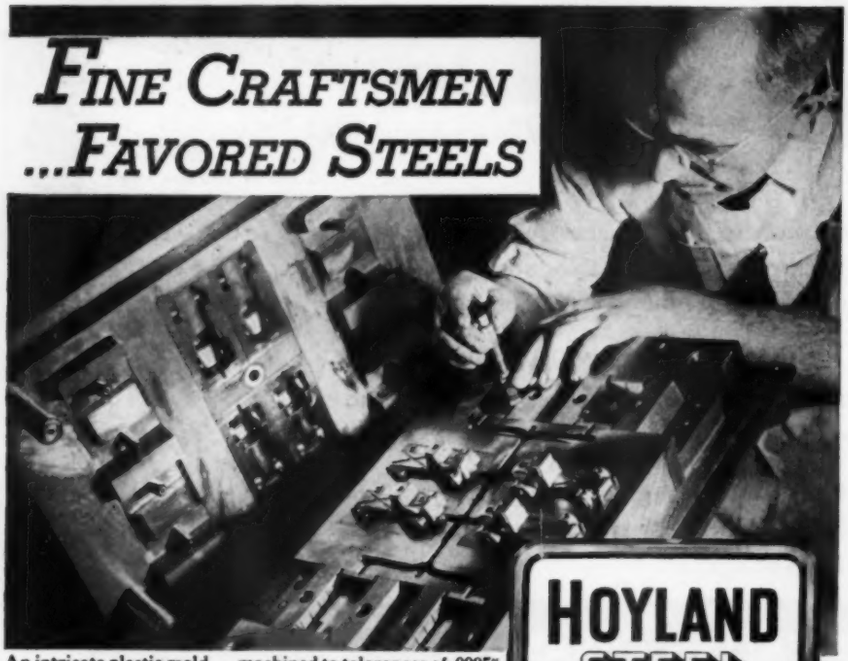

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any one. For example, it covers organization, designing, purchasing, planning, time study and many more.

The 4th edition has been brought up to date with new material added. Revised also is the list of references presented as a guide to more advanced study of individual topics.

•

PLANNING FACTORY MAINTENANCE—*By F. D. Denner. Published by Emmott & Co., Ltd., 31 King St. West, Manchester 3, England. 29 pages pocketsize. Price 1 shilling, 6 pence (30 cents).*

This addition to the list of Mechanical World Monographs discusses general maintenance practices as presented by industrial mechanization. The methods described herein are those evolved in British industry over a period of years.

Planning is emphasized as a necessity to insure adequate, regular service and thus to prevent breakdowns. Organization for maintenance is also treated adequately, charts being shown as a guide to a planned program.

"We Make Men Here"

"SAY, JOE," frowns overwrought shop foreman, George, as he taps his pencil nervously on his desk, "I'm mad as hell. Brown made an unnecessary show of his authority this morning and fired a couple of my good men."

"Well, Brown's the general superintendent, you know, and wields quite a weight around here! What'd he let 'em go for?"

"Bill and Tom were giving all they had on that repair job and had stopped to take a bite," George went on. "As I see it, Brown's dead wrong—especially firing the men himself," he fumed. "He should have taken it up with me and let me handle it. What am I around here anyhow—a figurehead?"

"Probably Brown thought you were too busy on other things. Don't take it so hard; you'll be able to get a couple of other fellows who can obey the rules."

"I'm not saying that the boys were right in what they did, understand," George reasoned, "but Brown was wrong; he missed up a good chance for some constructive discipline."

"And how would you have handled the situation?"

"Joe, I've always felt that it was poor policy not to give a man a chance—rules or no rules," explained the discouraged foreman. "If

Here's Why

Century Motor Insulation Contributes to Long Life

Windings and Insulation Are Built Into a Rigid Mass That Is Highly Resistant to Moisture and Abrasion

One of the important reasons why Century motors stay on the job is that they are so well protected to resist moisture and abrasion — hazards that often cause motor burnouts. The following information on Century motor insulation shows how Century engineers have solved the problem.

No. 1 — The insulation on the wire insulates between turns of the coil.

No. 2 — A combination of heavy fish paper and varnished cloth with high dielectric strength forms the slot insulation. This insulates the coil from the stator iron.

No. 3 — Fish paper formed to the correct contour and size insulates the coils from each other in the slot.

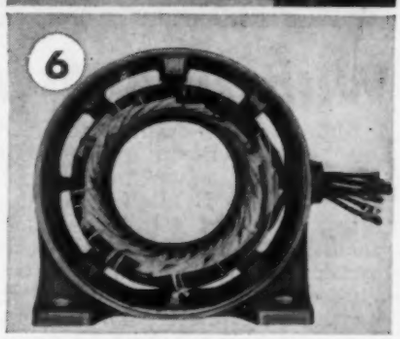
No. 4 — The "U" shaped fiber wedge draws the edges of the slot insulation together, closing the insulation cell, holding the coils in the stator iron — and wedging the coils rigidly in the slot.

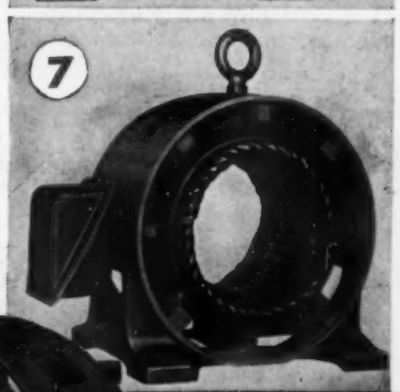
No. 5 — Shows how the coils are fitted into each slot together with the three pieces of insulation.

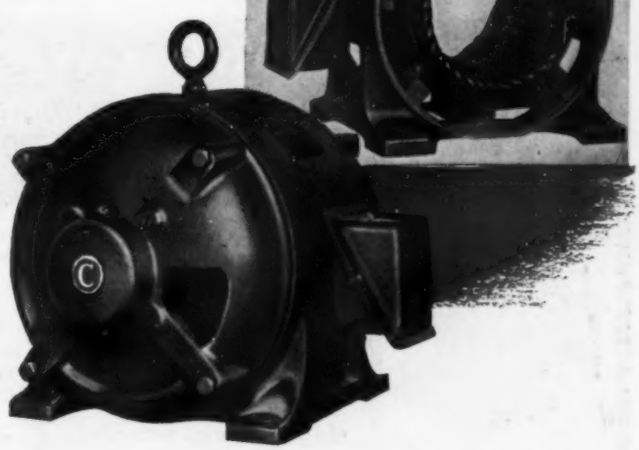
No. 6 — Shows the stator after the winding job has been completed, but before it has been dipped into the insulating compound. Notice the neat compact job of inserting and connecting the coils and lead wires.

The stator is then dehydrated in an oven, and immediately thereafter dipped into Century's special insulating compound and then baked. After each stator is thoroughly baked, repeating this process as necessary, it is given a final coat of heavy air drying varnish for mechanical protection.

No. 7 — The final result is a rigid mass that is thoroughly insulated — highly resistant to moisture and abrasion. The individual wires are held together and sealed to the stator core, eliminating chafing between wires and between coils and stator iron.







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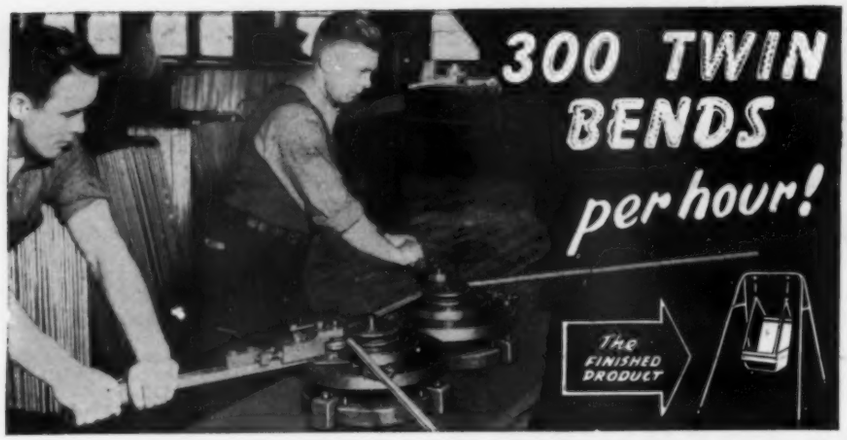

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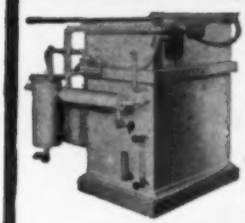

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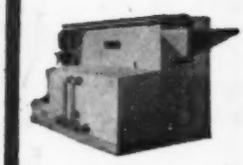
PICKLERS



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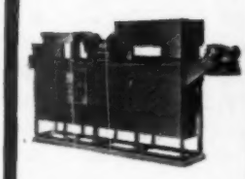

OPTIMUS EQUIPMENT

FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

he had reported the matter to me—as he should have done—and let me handle the thing I would have shown the men where they were wrong. See Benton over there? The fellow with the blue shirt? Well, I could have fired him only last week for a foolish move, but I took him into my office and had a good talk with him. The result is that he is a better man and a better workman—he has learned his lesson."

"There's a good point in what you say, but Brown's got to maintain his influence—you know, big shot and all that."

"Influence is right—I'll bet you if you were to ask our men what they thought of the situation they would agree that Brown was hasty and didn't use common sense. He actually reduced his influence instead of increasing it by acting the way he did. He showed he didn't stop to think things through, that he didn't have good judgment, that he had no confidence in me."

I've got a good idea for a sign for your shop, George," smiled Joe as he started away on his business. "Make up a sign with damn big letters that will read: WE MAKE MEN HERE."

John Homewood
Ontario, Calif.

TO THE EDITOR

I have just read with considerable interest the editorial in Jan. 1 AMERICAN MACHINIST, "How to Lower Prices."

I wonder if you would agree that in addition to points which you have specifically mentioned, that a change of method of production can often bring about lower prices for end products. I am thinking of the many instances where a switch from the old method to the use of stampings has greatly increased the production per manhour and produced a better quality product at a lower price.

Our investigations of many industries indicate increased use of stampings. One particular instance is the case of a large producer of agricultural machinery. The head of this company has stated to us that his engineers have designed *only* for stampings for the last 1½ years, and have converted over 200 items from castings to stampings in that period of time.

Probably nowhere is there a greater opportunity for savings through modern equipment than in the average press shop.

Ernest C. Morse
Lockhart International Inc.

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HALIFAX, NOVA SCOTIA
A. R. Williams Machy. Co. Ltd.
HONOLULU, T. H.—Electric Steel Foundry Co.
HOUSTON, TEXAS—C. H. Collier Company
INDIANAPOLIS, IND.
Central Rubber & Supply Co.
JACKSONVILLE, FLA.—L. S. Teague Eqpt. Co.
KANSAS CITY, MO.
Industrial Power Equipment Co.
LOS ANGELES, CALIF.—Hyster Company
LOUISVILLE, KY.—Embry Brothers, Inc.
MEMPHIS—Hyster Co. of Louisiana, Inc.
MILWAUKEE, WIS.—Hyster Company
MINNEAPOLIS, MINN.—W. S. Nott Company
MOBILE, ALA.—S & T Equipment Co., Inc.
MONTREAL, P. Q.
A. R. Williams Machy. Co., Ltd.
NEW ORLEANS, LA.
Hyster Company of Louisiana, Inc.
NEW ROCHELLE, N. Y.
Eastern Industrial Sales Co.
OTTAWA, ONT.
A. R. Williams Machy. Co., Ltd.
PHILADELPHIA, PA.
Rapids Handling Equip. Co. of Phila., Inc.
PHOENIX, ARIZ.—Equipment Sales Company
PITTSBURGH, PA.—Equipco Sales Company
PORTLAND, ORE.—Hyster Sales Company
ST. JOHNS, N. F.—City Service Company, Ltd.
ST. LOUIS, MO.—Wharton L. Peters
SALT LAKE CITY, UTAH
Arnold Machinery Company
SAN FRANCISCO, CALIF.—Hyster Company
SEATTLE, WASH.—Hyster Company
TORONTO, ONT.
A. R. Williams Machy. Co., Ltd.
VANCOUVER, B. C.
A. R. Williams Machy. Western, Ltd.
VICTORIA, B. C.
A. R. Williams Machy. Western, Ltd.
WINNIPEG, MAN.
A. R. Williams Machy. Western, Ltd.
YUKON TERRITORY
Northern Commercial Company

HYSTER COMPANY

THREE FACTORIES
2902-14 N. E. Clackamas, Portland 8, Ore.
1802-14 North Adams St., Peoria 1, Illinois
1010-14 Meyers Street, Danville, Illinois

In addition to above, Hyster Export Dealers are located in 30 foreign countries.

Names in the News

Maurice Stanley

Stanley M. Cooper

Maurice Stanley, president of The Fafnir Bearing Co., New Britain, Conn., for the past 21 years has been elected chairman of the Board and **Stanley M. Cooper,** executive vice president, has been named president.

William H. Schuster has been named welding supervisor of the American Car & Foundry Co., New York. From 1935-40 he was with the Lincoln Electric Co. and recently was associated with the Foster Wheeler Corp.

Fred Pasher has been transferred as manager of the Cleveland branch to manager of the Dallas branch of The Wagner Electric Corp., St. Louis, Mo., replacing the late **B. B. Pierce. Elmer Gent,** formerly in the Pittsburgh area has been named manager of the Cleveland branch.

Walter C. Leitch

Walter C. Leitch has been elected vice president and general manager of The Aro Equipment Corp., Bryan, Ohio. He was recently general manager of Gilbert & Barker Manufacturing Co., Springfield, Mass.

Philip F. Thayer has been named manager of manufacturing in the California and Ohio plants of the National Motor Bearing Co., Redwood City, Calif. He was formerly vice president in charge of engineering and a director of the Rheem Manufacturing Co.

E. H. Phillips, formerly manager of the mine gears and parts division, has been named general sales manager of the Pittsburgh Gear Co., Pittsburgh.

Henry Harnischfeger, a member of the board, has been elected a vice president of the Harnischfeger Corp., Milwaukee, Wis.

Alvan Macauley, former president of Packard Motor Car Co. for 23 years and chairman of the board since 1939, has retired along with two other directors, **Henry E. Bodman** and **Robert B. Parker.**

J. E. Sawtelle has been appointed manager of the export division of The Hinderliter Tool Co. Div., the H. K. Porter Co., Inc., Pittsburgh, with headquarters in Porter's New York office.

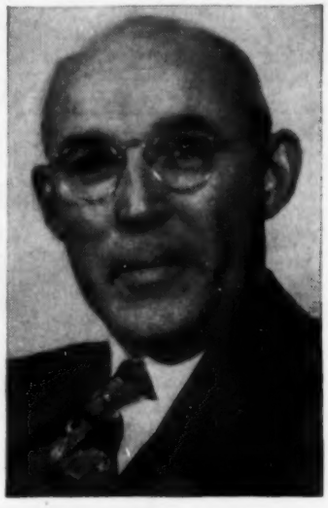
Roger W. Batchelder has been appointed assistant to the president of the National Bearing Div., American Brake Shoe Co., while **William H. Old** has been named to succeed him as general purchasing agent for American Brake Shoe.

Norman B. Johnson, assistant executive vice president of Pullman-Standard Car Manufacturing Co. has been named to head all operating activities of the Pullman Car Works, Chicago passenger car division.

Henry F. Kalweit, former controller, has replaced **John T. Kilbride** as president of The Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn. Other management changes include **William G. Schultz,** who became vice president in charge of sales and the machinery division, and **Frank B. Laurich,** vice president in charge of the wheel division.

M. H. Blesh has been named manager of manufacturing for the Controls Div. of General Electric Company's Apparatus Dept. Other appointments include **C. B. Bradish,** manager of engineering and **E. A. Green,** manager of sales.

Clinton E. Stryker has been elected president of Maysteel Products, Inc., Milwaukee, Wis. Head of the group which recently purchased the firm, Mr. Stryker was formerly president of Adel Precision Products Corp. and Aerco Corp., Burbank, Calif.



James L. Byrom

James L. Byrom has been appointed manager of the Chandler-Evans Div. of Niles-Bement-Pond Co., West Hartford, Conn. He succeeds **Leslie McArthur,** who was recently appointed a vice president.

Haskell C. Carter has been named vice president in charge of manufacturing of the Iron Fireman Manufacturing Co. with plants in Portland, Ore., Cleveland and Ontario, Canada.

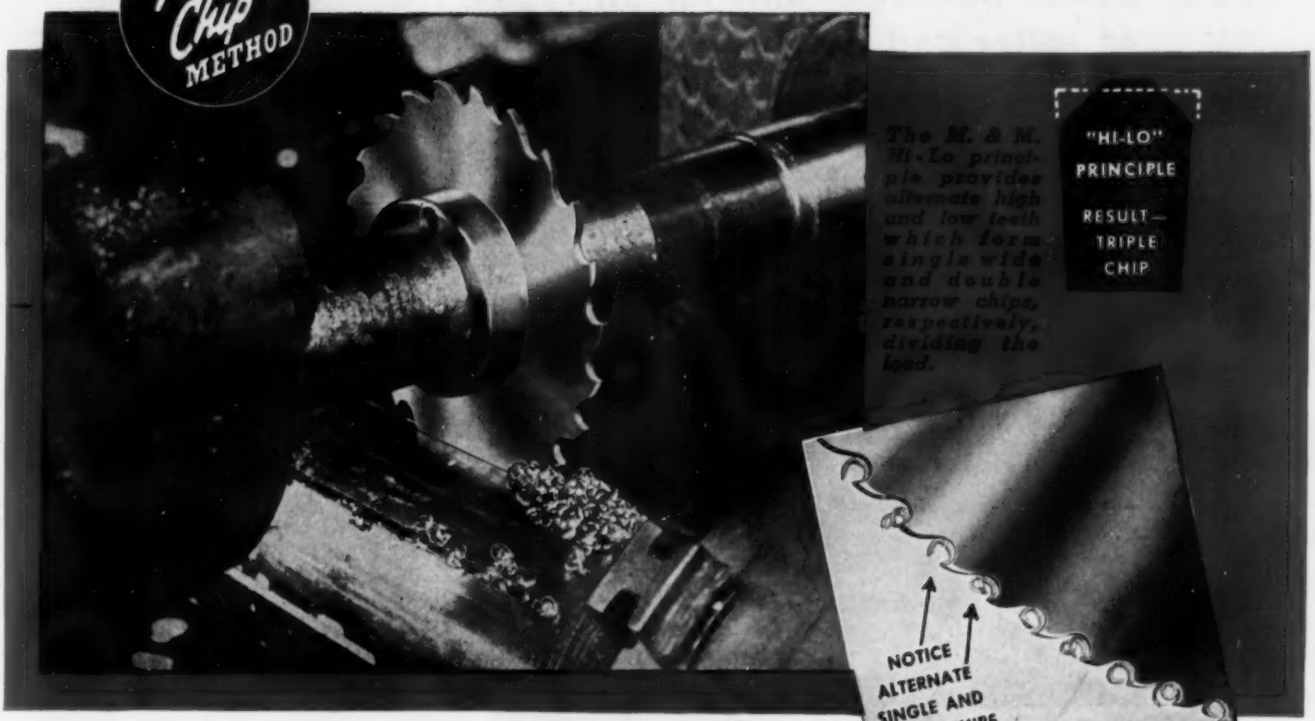
Dr. John A. Hutcheson has been appointed director of the Westinghouse Research Laboratories, succeeding **Dr. L. Warrington Chubb,** who has been named director emeritus following his retirement. Dr. Hutcheson, formerly associate director, directed the company's wartime radar research program and formulated plans for atomic energy development.

J. A. Sauer, president since 1944, has resigned as head of the Symington-Gould Corp., Rochester, N. Y.

BREAK UP *Your Chip Loads..*

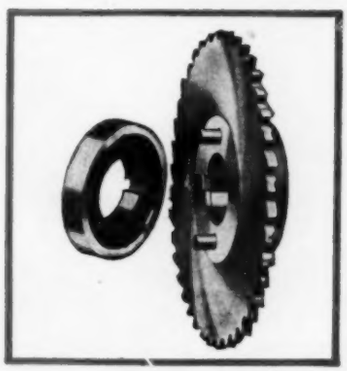
CASH IN ON FASTER FEEDS AND SPEEDS!

Triple-Chip METHOD


"HI-LO" PRINCIPLE
RESULT— TRIPLE CHIP
The M. & M. Hi-Lo principle provides alternate high and low teeth which form single wide and double narrow chips, respectively, dividing the load.
NOTICE ALTERNATE SINGLE AND DOUBLE CHIPS

MOTCH & MERRYWEATHER *Slitting Saws*

GIVE GREATER SPEEDS AND LONGER TOOL LIFE



Motch & Merryweather's original dual drive equalizes stresses, gives plenty of driving power, and makes blade keyways unnecessary

M. & M. Slitting Saw Blades enable you to profit from record-breaking speeds and satisfying accuracy. They give you all the well known advantages of the Triple-Chip Method. The characteristic M. & M. curved, cam-generated tooth contour avoids clogging, since the curling chips are self-clearing. A generous gullet imparts great strength to the teeth. Result: faster cutting, longer blade service.

Exclusive dual drive design supplies positive driving power and protects the driving means; practically no blade breakage. Blades adaptable to arbors up to 1¼"; interchangeability conserves blade investment. Range of pitch in all diameters and thicknesses. Other big advantages, too.

Get well illustrated Bulletin "A-4"

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

CUTTING TOOL DIVISION

AT YOUR COMMAND · AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

Announcing the new Standard

HANDI-DRIVE

. . a "power package" unit for all types of roller and belt conveyors

New self-contained drive unit simplifies and cuts costs of conveyor planning and installation

Here it is! A packaged power unit that gives every conveyor user the opportunity to be his own layout engineer — to change his conveyor system to suit varying plant conditions in a minimum of time!

Converts gravity conveyors to live belt or roller conveyor quickly . . at low cost

The Handi-Drive is a self-contained drive unit for applying tractive power to gravity conveyor belt or rollers. Equally important, using standard units you can build a conveyor system custom-planned to your individual plant needs. Standard units are stocked at the factory — you can get them now!

If you want to convert your present gravity conveyors to powered units — or if you want to install your own new system . . . send for the Handi-Drive Bulletin No. AM-48. It gives you complete design information and prices — tells you how to lay out your system, gives complete data on inclines, belt and roller widths, curves, weights to be handled and types of packaging or units to be moved. Write: Standard Conveyor Company, North St. Paul, Minnesota.

SEND FOR HANDI-DRIVE BULLETIN

Standard
GRAVITY & POWER
CONVEYORS

NAMES IN THE NEWS

I. J. Barber

I. J. Barber, director of engineering for Fostoria Pressed Steel Corp., Fostoria, Ohio, has been promoted to the vice presidency of the firm.

Earl B. MacDonald, sales manager of the Machine Tool Division of the Syracuse Supply Co., Syracuse, N. Y., has been named vice president and general manager of the division.

George C. McMullen is now vice president in charge of sales of the Tyson Bearing Corp., Massillon, Ohio. **W. H. Oexle** has joined Tyson as general sales manager. For the past 12 years he has been associated with the L. S. Starrett Co., Athol, Mass. **Herschel J. Dean**, vice president, has been placed in charge of the midwest territory with headquarters in Chicago.

Charles C. Wells has been elected president of the Clyde Porcelain Steel Corp., Clyde, Ohio succeeding Eugene R. Farney.

Donald L. Herr has joined the engineering department of Allen-Bradley Co., Milwaukee, Wis., to develop servo-mechanisms for machine tools and other motor controls.

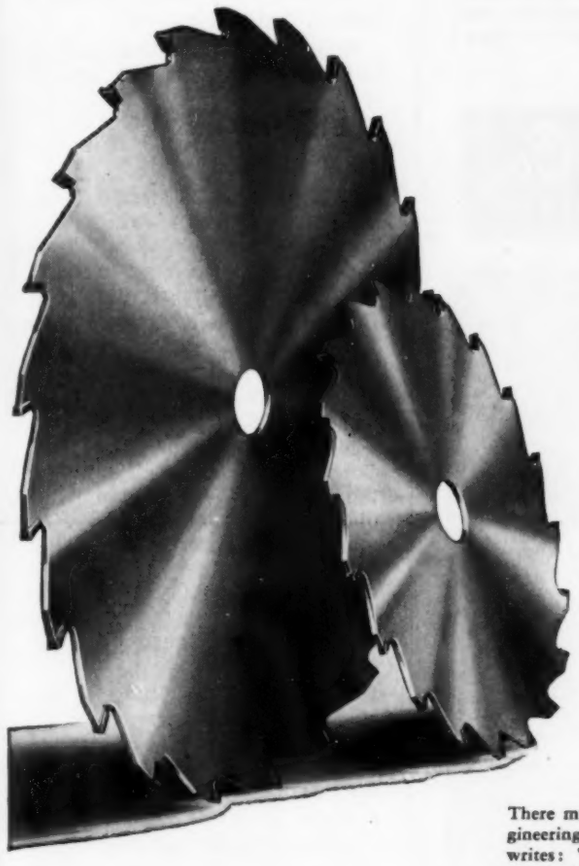
Andrew A. Priest has been named factory manager of Thomas A. Edion, Inc., Instrument Div., West Orange, N. J.

David D. Wood has been named general manager of the Superhydraulic Corp., Detroit.

J. P. Vederko has been promoted to general superintendent of the Cross Co., Detroit.

A DOUBLE-BARRELLED JOB:

A Carbide-Tipped SAW THAT CUTS PLASTICS AND CUTS COSTS

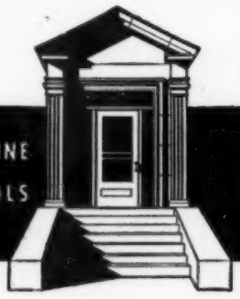


Yes indeed . . . this MEYCO saw cuts plastic and other synthetic materials successfully. It is the result of more than a year's experience in solving tough cutting problems on special order for customers. This Carbide-Tipped saw has been engineered for its job: the blade, the teeth, the set are all designed for tungsten carbide, the hardest known satisfactory cutting material next to diamonds.

A MEYCO saw will cut and KEEP ON CUTTING for an unbelievably long time. Here is long life with a minimum of resharpening . . . filing eliminated altogether . . . time and cost saving . . . smooth, clean edges on the work cut . . . a saw that certainly merits your immediate investigation.

Write for full information and prices (which, incidentally, will come as a pleasant surprise).

There must be something to the engineering of this saw when one user writes: "More than 80,000 feet of plastic sheets have been cut and it looks good for as much again." Manufacturing fine cutting tools for well over half a century has given us the know-how to save you money on your cutting problems.



60 YEARS OF FINE CUTTING TOOLS

W. F. MEYERS CO., INC., BEDFORD, INDIANA

Step Up Output of Precision Parts

SHAPE-RITE
8" Stroke Hy-Duty Model
SHAPER

The 8" Hy-Duty Model Shaper, taking a full 8" cut, is unexcelled for tool and die makers and small instrument manufacturers.

SHAPE-RITE SHAPERS are engineered to provide faster set-ups . . . one of the most important elements for greater production.

Maximum versatility . . . controls within easy reach . . . and many other built-in features cut set-up time to a minimum and eliminate many costly jigs.

Furnished with plain or swiveled table, the SHAPE-RITE SHAPER provides fast economical operation. Investigate it now!

See your local dealer or write Dept. 88.

Sales Service Machine Tool Co.
2363 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

IT'S AS EASY AS PIE . . .
TO CUT KEYWAYS, BY HAND, IN 1 MINUTE!
Any Standard Width Keyway, Any Depth—In GEARS, CUTTERS, COUPLINGS, COLLARS, PULLEY HUBS, ETC.
with this Minute Man KEYWAY BROACH KIT . . .
Precision-made and handsomely cased by
The du MONT CORP.
GREENFIELD, MASSACHUSETTS
MAIL THIS COUPON

The du Mont Corporation, Greenfield, Mass.

Please mail Descriptive Folder and Price List A together with the name of the Mill Supply Distributor that can show us the complete range of *Minute Man* Kits.

Company.....

Address.....

Name and Position.....

BUSINESS ITEMS

The Warner & Swasey Co., Cleveland, has opened its new Los Angeles showroom, warehouse and western sales headquarters at 3340 Leonis Blvd. in Vernon. **L. R. Hawkins,** California district manager, is in charge.

E. W. Bliss Co., Detroit, will handle all New England sales and service operations from its New Haven office at 129 Church St. **Frank Beattie** has been named district manager. **Fred A. Power,** Bliss' New England sales representative for 30 years, has retired and the Boston office closed.

The Yale & Towne Mfg. Co., Philadelphia, has unified its Chicago sales and service facilities for its electric truck, handlift truck and dial scale divisions at the Railway Exchange Bldg., 80 E. Jackson Blvd., under **Arthur H. Dobler,** regional manager.

Aluminum Co. of America has virtually completed the transfer of its sand and permanent mold casting operations from Fairfield, Conn., to its new Bridgeport plant.

The Permanente Metals Corp. is making plans for a flexible aluminum rod mill in Spokane, Wash., capable of processing over 120 million lbs. of metal annually.

Revere Copper & Brass, Inc., has started construction of a plant in Los Angeles which will manufacture seamless copper and alloy tubing and brass rod.

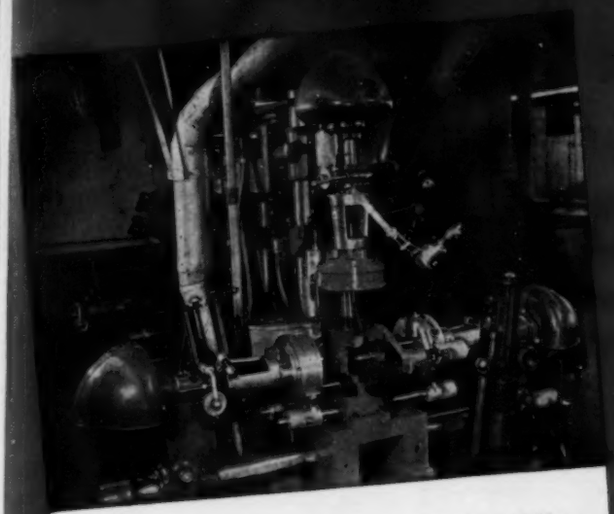
National Electric Products Corp., Pittsburg, has purchased the **Joshua Hendy Iron Works** plant in Torrance, Calif., for production of flexible conduit and tubing and other electrical fittings.

The Baker-Industrial Truck Div., The Baker-Raulang Co., Cleveland, has appointed the **Hooper-Green Co.,** 1039 No. Pennsylvania St., Indianapolis as its district sales representative in Indiana. **A. J. Stone** is manager of the Indianapolis Hooper-Green branch.

Atlantic Steel Co., Atlanta, Ga., has formed a **Warehouse Div.** and a **Manufacturing Div.** of the firm. The Warehouse Div. stocks various types of finished steel as well as rivets, washers, bolts and nuts, while the service offered by the Manufacturing Div. include metal stampings and forgings, heat treating and job galvanizing.

Brown-Bevis Equipment Co., Los Angeles has bought the operating business and assets of **Salsbury Motors,** former subsidiary of Northrop Aircraft.

How the Makers of BEACON CAMERAS Use "Controlled-Air-Power" to cut production costs . . .



WHITEHOUSE PRODUCTS, INCORPORATED
360 FURMAN STREET
BROOKLYN 2, N. Y.

December 9, 1947

The Bellows Company
222 W. Market Street
Akron, Ohio

Gentlemen:

Part of our ability to produce our new top quality Beacon Camera at a low cost figure is certainly due to some of the multiple drilling operations we are handling on special machines equipped with Bellows "Controlled-Air-Power" DFE Feeds.

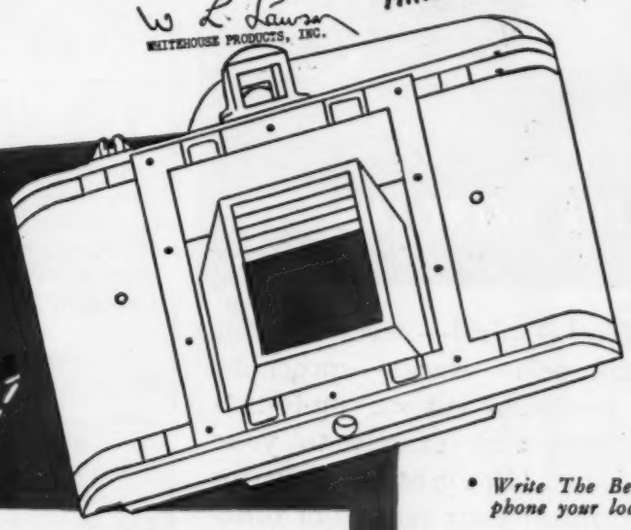
For example, on one set-up we are drilling ten #55 holes on one plane, three #51 holes on a second plane, two #38 holes on a third plane, and drilling and countersinking one ¼" hole on a fourth. The material, as you know is bakelite.

In addition we are using two other drilling set-ups with Bellows Feeds for certain other operations, and are now in the process of installing a fourth multiple drill unit, likewise equipped with your "Controlled-Air-Power" Feeds.

Yours very truly

W. L. Lauza
WHITEHOUSE PRODUCTS, INC.

EVERY HOUR 5760 HOLES ARE DRILLED AND 360 COUNTERSUNK IN 360 ACCURATELY FINISHED PARTS



WE'D LIKE TO TELL YOU MORE ABOUT IT

Using standard units, you can build in your own tool room, or have built by established engineering firms, inexpensive "special purpose" machines for low cost machining of precision parts.

In fact, manufacturers everywhere are proving that such units pay for themselves quickly, often with the first few days production increase.

The simplicity, ready adaptability and low cost of Bellows "Controlled-Air-Power" Devices (non-rotating Air Motors, air-powered work or tool feeds, air-powered vises and holding fixtures) make such special purpose machines both economical and practical, whether the run is long or short.

The installation shown in this ad is described in detail in Foto Facts File FF47-359. We will be happy to send you this and other Foto Facts File Sheets, together with the new 16 page bulletin "Controlled-Air-Power." No cost or obligation, of course.

• *Write The Bellows Co., Bellows Bldg., Akron, Ohio, or phone your local Bellows Field Engineer.*

The Bellows Co.
AKRON, OHIO

INCREASE YOUR PRODUCTION

with a KALAMAZOO METAL CUTTING BAND SAW

MANY SPECIAL FEATURES

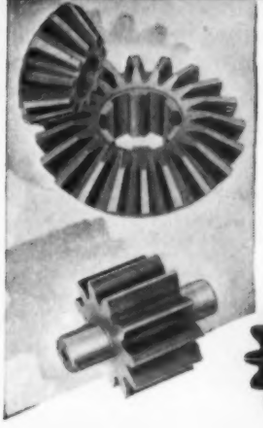
If you have a cut-off problem, whether on rods, bars, tubes or odd shapes—investigate the high speed—accuracy—quick set-up and economy of the low cost Kalamazoo Band Saw.

95% of all cut-off jobs come within its capacity. Coolant model (illustrated) permits continuous production.

Ask your dealer or write for bulletin on this MONEY SAVING TOOL.

A product of
MACHINE TOOL DIVISION
KALAMAZOO **KALAMAZOO TANK & SILO CO.** **MICHIGAN**

GEARS FOR EVERY INDUSTRY



Spur—bevel—spiral—Zerol—worms and worm gears—racks—sprockets. All are precision cut on up-to-the-minute equipment exactly to your specifications. *Prompt quotation upon receipt of your sample or blueprint. No limitation on gear size.*

E. B. SEWALL MANUFACTURING CO.
688 Glendale St. St. Paul 4, Minn.

OBITUARIES

Charles M. Gunn, 77, first president of Columbia Steel Co., died Feb. 20.

Tracy V. Buckwalter, 67, retired vice president of the Timken Roller Bearing Co., died March 15.

Joseph H. Slater, 54, assistant manager of the Cleveland district of Republic Steel Corp., died suddenly March 8.

Albert Emerton, 57, manager of the Brookline Machine Co., Boston, died March 9.

Edward E. Wallace, 65, mathematical expert in the mechanical engineering department of Warner & Swasey Co., Cleveland, since 1939, passed away March 4. He was formerly a designer for the Peerless and White Motor Co. and was associated with Glenn L. Martin when he started his aviation factory in Cleveland.

Leon H. Marsh, vice president and secretary of the Kennedy Valve Mfg. Co., Elmira, N.Y., died March 11.

Kenneth N. Cook, assistant sales manager of the Rollway Bearing Co., Inc., Syracuse, N.Y., died suddenly March 5.

Leslie A. Wiggins, 55, vice president in charge of the Rome, N.Y. division of Revere Copper & Brass, Inc., died March 5.

James E. McKelvey, 84, former president of the old American Woodworking Machinery Co., Rochester, N.Y., passed away March 5.

Edward R. Case, 59, who formerly operated a machine shop in Buffalo, N.Y., died March 9.

MEETINGS

American Foundrymen's Association. Convention and foundry show. Convention Hall and Commercial Museum, Philadelphia. May 3-7. William W. Maloney, secretary-treasurer, 222 W. Adams St., Chicago 6.

American Management Association. Production conference. Palmer House, Chicago. May 13-14. Edward K. Moss, public relations director, 330 W. 42 St., New York 18.

American Society of Lubrication Engineers. Annual convention and exhibit. Hotel Statler, Buffalo. April 19-21.

Westinghouse Machine Tool Electrification Forum. Hotel Statler, April 22. Buffalo plant, April 23. Buffalo, N.Y.

For more profitable production

VARIABLE SPEEDS

MEET PRODUCTION "VARIABLES"

Fingertip speed control provides positive power at the correct production speed – faster or slower. Improved Sterling Speed-Trol gives you infinite speed control in a single, rugged, dependable power unit occupying one half the space formerly required – fits standardized motor mounting – incorporates V-Belt and proven engineering principles.

Improved STERLING
SPEED-TROL

SEND FOR NEW INFORMATIVE LITERATURE

SLOW SPEEDS

USE GEARED CONSTANT SPEED

There is no other known method of obtaining constant slow speed that is as efficient or economical in operation as this improved Sterling Slo-Speed motor. Sterling Slo-Speed motors with gears, motor, and all parts Sterling-made into one rugged, compact unit, will give you long, dependable service at the "one best" constant production speed.

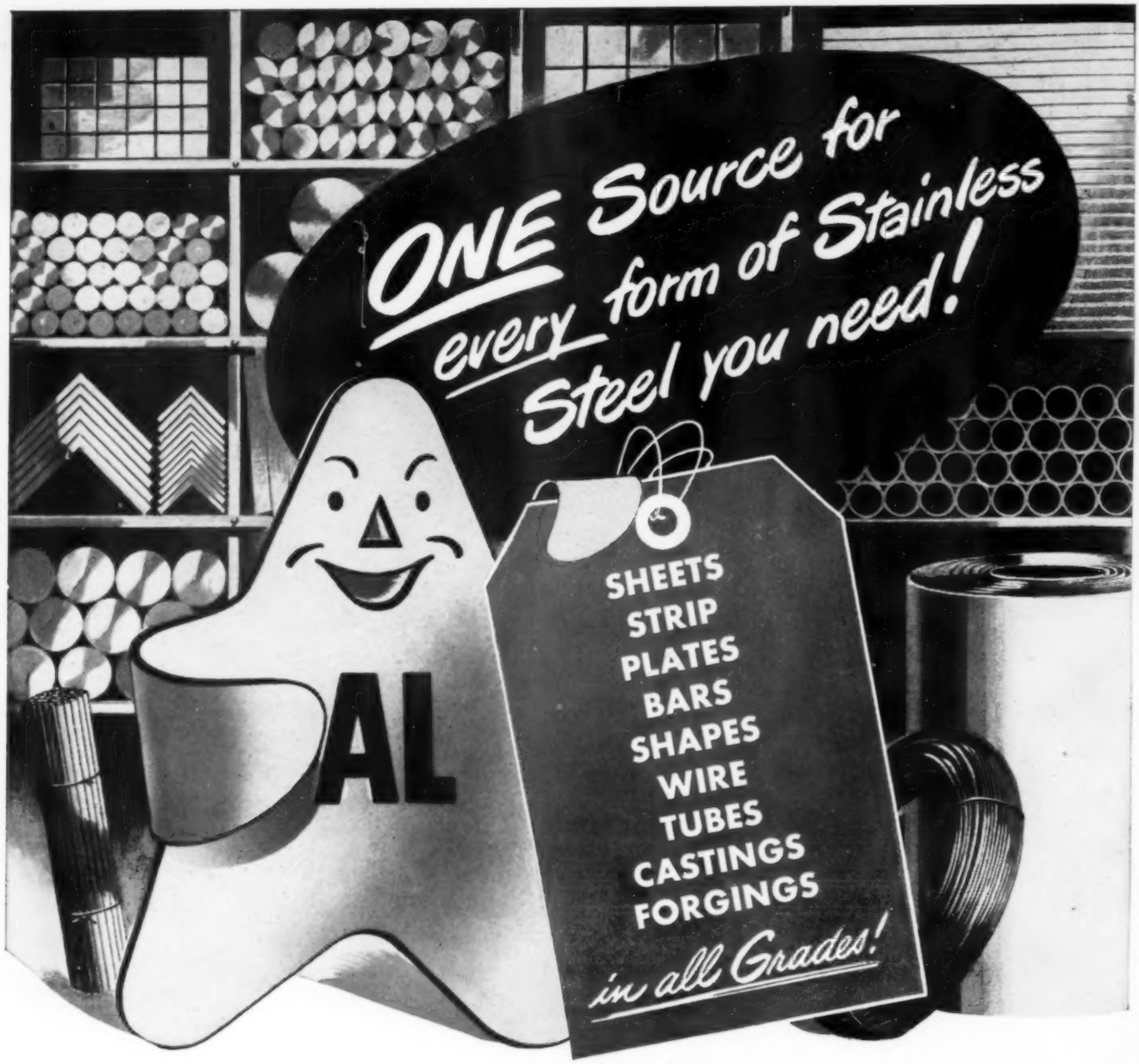
Improved STERLING
SLO-SPEED

SEND FOR NEW INFORMATIVE LITERATURE

Thousands of satisfied, world-wide users are increasing plant profits with Sterling Speed-Trol and Sterling Slo-Speed motors.

STERLING ELECTRIC MOTORS

GENERAL OFFICES: LOS ANGELES 22, CALIFORNIA
New York 1 • Chicago 6 • Detroit 2 • Boston 35 • Philadelphia 7 • Cincinnati 2
St. Louis 8 • Atlanta 3 • New Orleans 13 • Dallas 1 • San Francisco 5 • Seattle 4
Representatives in Principal Cities and Foreign Countries



Design for

PERMANENCE!

...Are you battling a shortage of materials? Stainless steel may be able to win new competitive advantages for you—perhaps at little or no added cost—and you can get Allegheny Metal *now!*

CALL FOR AN ALLEGHENY LUDLUM ENGINEER

Allegheny Metal is the only stainless steel that is produced in *every* form or shape in which steel can be used.

That's advantageous to both the fabricator and user of stainless equipment. It means undivided responsibility, a single source of supply and of technical assistance, and the same dependably uniform quality from one end of the list to the other. Fabricating conditions are known and constant, with the result that cost figures are lower and the performance of finished equipment is better.

Best of all, you can *get* Allegheny Metal and you can get it *now,* in mill or warehouse shipments. Let us work with you—whatever your need or problem.

ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

Nation's Leading Producer of Stainless Steels in All Forms

AL

W&D 1554

ALLEGHENY METAL is stocked by all Joseph T. Ryerson & Son, Inc. warehouses

Where the GOING is toughest and the STOPPING is fastest

STAR BRAKEMOTORS

first choice of the first names in material handling equipment and other machines that must start fast and STOP even faster

Talk with the operator of a hoist, crane or printing press . . . any machine that has to stop on a dime or less . . . and ask him what brakemotor he has in that equipment. If he can't tell you the name right off, it's probably a Star Brakemotor. Because Star builds brakemotors that don't need looking at or thinking about. Star makes both the brake and the motor together . . . to work together. It makes them simpler, sturdier, more compact, more trouble-free. Machinery makers like Star Brakemotors because they're good will protectors. And users like them because they perform better and cost less for maintenance.

The reasons . . . important to you . . . are fully explained in a new Data Folder on Star Brakemotors. Write for it today, or ask to have a Star engineer show you the advantages of a Star Brakemotor for your equipment. Star Electric Motor Corporation, 200 Bloomfield Ave., Bloomfield, N. J.

Star makes *both brake and motor, makes them for each other . . . to work with each other.* It's easy enough to put a brake on a motor. But quick stops on heavy machinery often require stopping torques greater than the starting torques. Smooth, perfectly controlled braking that conserves power and takes the least maintenance is a job for a unit-designed, unit-constructed brake and motor . . . the Star Brakemotor. It's a spring actuated, magnetic release, multiple disc brake integrally mounted with the motor on a common ball-bearing shaft. No electrical energy is used in braking or holding loads.

More STOP and GO power in less space. Brake and motor, made together to work together, fit together into a more compact, space saving unit. Perfectly aligned and balanced on a common shaft. Longer life for bearings and brake linings.

Sure stop all stops. Equally spaced magnets and springs give uniform pressure and smooth stopping. Operates quickly, positively when power fails, holds load until power is restored. Extra heavy duty brake linings used because lining plates are stationary, add nothing to rotating inertia. Ample braking pressure to overcome rotating inertia of shaft and attached load and to hold the load.

Set and forget. Braking torques can be set by means of adjustable springs. Simple, positive mechanical action. Safe, sure braking hundreds of times an hour, day after day with an absolute minimum of maintenance.

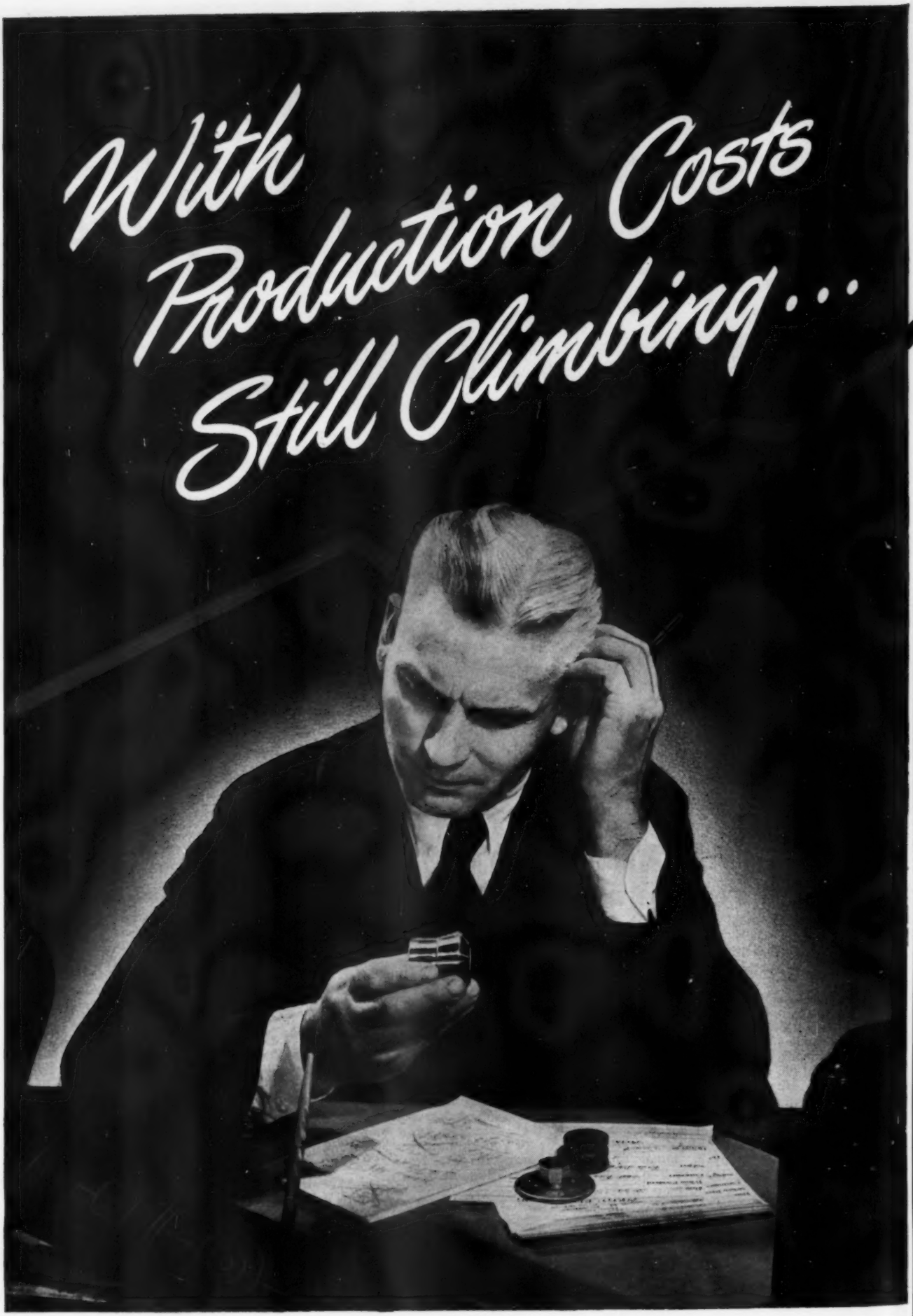
★ ★ ★

Star Brakemotors are available in continuous torque ratings from 2 to 140 lb.-ft. and in intermittent torque ratings from 3 to 233 lb.-ft. Five basic sizes. Number of braking surfaces, types of magnets and springs can be varied to provide wide range of braking torques.

Star A.C. squirrel cage or wound rotor induction motors or Star D.C. motors in standard NEMA frame sizes up to 445. Motor ratings from ½ to 40 h.p.

STAR MOTORS

POWER PACKAGED AS YOU NEED IT


With Production Costs Still Climbing...

YOU NEED THIS IMPROVED

MACHINABILITY

In spite of the steady rise of fixed costs in the manufacture of steel parts, there still is one way in which you may strengthen weakening profit margins . . . through the *improved* MACHINABILITY of Republic Cold Drawn Steels.

This top MACHINABILITY—achieved without sacrifice of surface quality, physicals, soundness, tolerance or response to heat treatment—may be just what you need to raise production efficiency, step up output, cut unit costs and improve quality. It may permit higher speeds and feeds. It may reduce tool wear. It may make possible a smoother, brighter machined surface.

For 59 years, Union Drawn metallurgists and engineers have studied the machining characteristics of various steels. By cutting up tons of steel in laboratories and by observing performance in customers' plants under actual operation conditions, they have been able repeatedly to improve the MACHINABILITY of Republic Union Cold Drawn Steels. Furthermore, they have acquired unequalled machinery knowledge and experience which is yours for the asking.

Why not take advantage NOW of this cost-cutting combination of MACHINABILITY and machining assistance to help head off climbing production cost curves? A Union Drawn metallurgist is ready to talk to you.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • • • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

Republic

REPUBLIC STEEL
REG. U. S. PAT. OFF.

DS

UNION COLD DRAWN STEELS

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Free-Machining Bessemer, Alloy and Enduro Stainless Steels

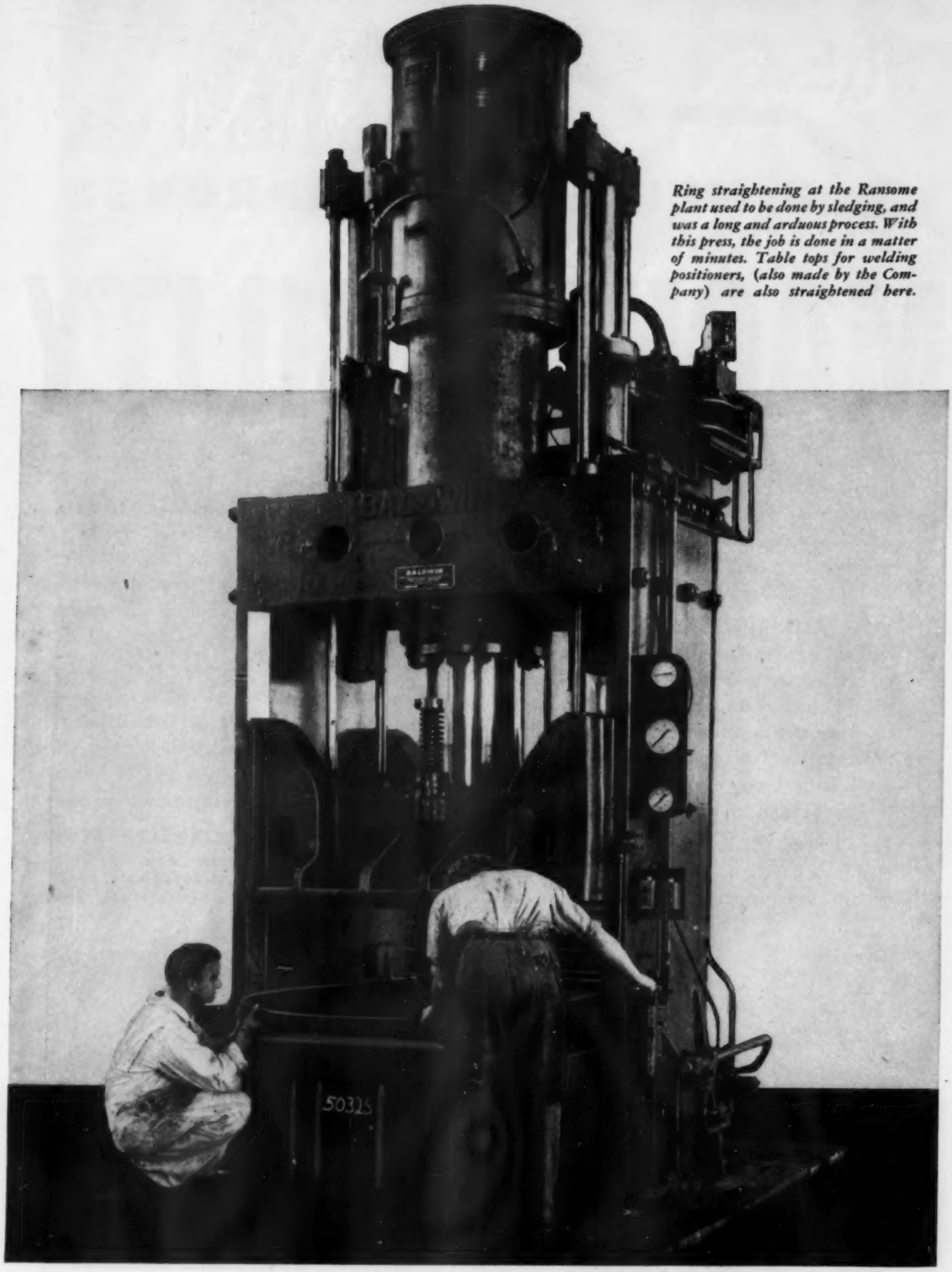
•

Union Cold Drawn Special Sections

•

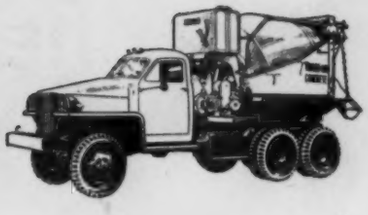
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

How the "Ransome" became an

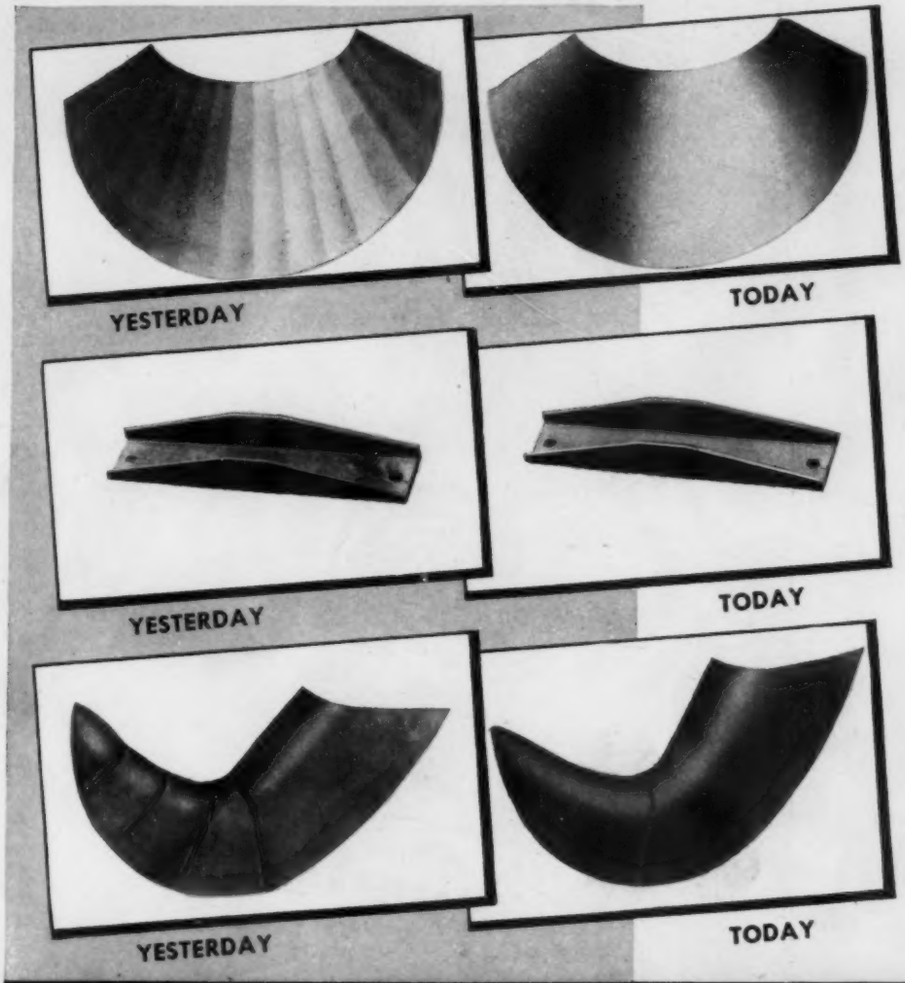


Ring straightening at the Ransome plant used to be done by sledging, and was a long and arduous process. With this press, the job is done in a matter of minutes. Table tops for welding positioners, (also made by the Company) are also straightened here.

even better mixer with BALDWIN HYDRAULIC PRESSES



On highway and construction projects everywhere you'll see Ransome "Blue Brute" concrete equipment—dual and single drum pavers, "Hi-up" truck mixers and agitators, large stationary mixers and smaller portable mixers. Intent on continuously improving its equipment, and faced—like all manufacturers—with the necessity of reducing costs, Ransome, in 1947, attacked these twin problems by installing a Baldwin hydraulic press. The reduction in production operations, and the improvement in results, are indicated by the typical examples shown. Baldwin-Southwark Hydraulic Presses are helping manufacturers in many lines to make better products, at higher speed, and at lower cost. If you look, you can probably find places in your factory where a Baldwin press could serve you. If you would like to see a Baldwin representative, please get in touch with the nearest Baldwin office.



YESTERDAY—*Discharge chutes, of various types and sizes, were formed on a brake, by as many as 30 separate operations.*

TODAY—*The sheared blank is placed on a die, and formed to smooth, exact shape in a single operation.*

YESTERDAY—*Drum door holddown plates were formed on a brake, in two operations.*

TODAY—*The holddown plates are formed on the press with one stroke of the ram.*

YESTERDAY—*Individual sheared segments were bent, assembled in a jig, and welded. Each weld left a "dam" to obstruct the smooth flow of concrete.*

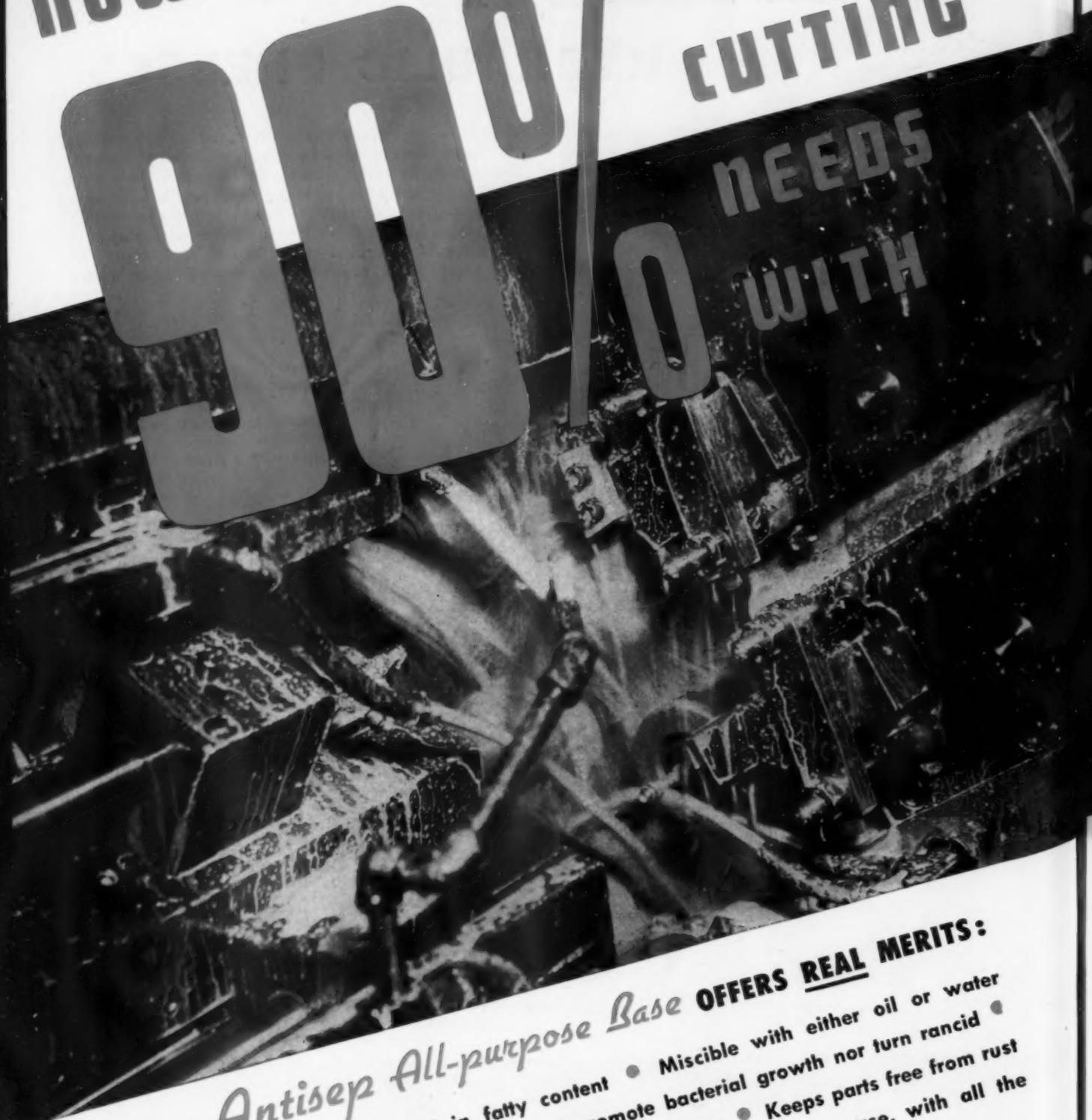
TODAY—*Long sections of the discharge blades are formed in one operation. In addition to cost reduction, the unobstructed floor means better product performance.*

BLW THE BALDWIN GROUP

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A.

Offices: Boston, New York, Philadelphia, Birmingham, Houston, St. Louis, Chicago, Cleveland, Pittsburgh, San Francisco, Seattle, Washington.

now you can meet 90% of your cutting needs with



HOUGHTON'S *Antisep All-purpose Base* **OFFERS REAL MERITS:**

High in sulphur and in fatty content • Miscible with either oil or water • Antiseptically treated—will not promote bacterial growth nor turn rancid • Usable also as lubricant for drawing or stamping • Keeps parts free from rust • Less handling, storage, inventory—only one product to use, with all the strength of old-style bases.

Houghton's new

ANTISEP

All-purpose Base

MISCIBLE WITH EITHER OIL OR WATER

Antisep is the biggest news in cutting oils since 1915, when Houghton patented Refrigerant Base, the first concentrate ever developed.

Antisep is versatile, handling so many different types of machining jobs that it promises to change cutting oil standards.

Antisep is a natural for automatics. Even a water dilution has high film strength. Its antiseptic properties appeal to operators; its ability to cool better and provide fine finish appeals to everyone. Try it, and you'll buy it!

E. F. HOUGHTON & CO.

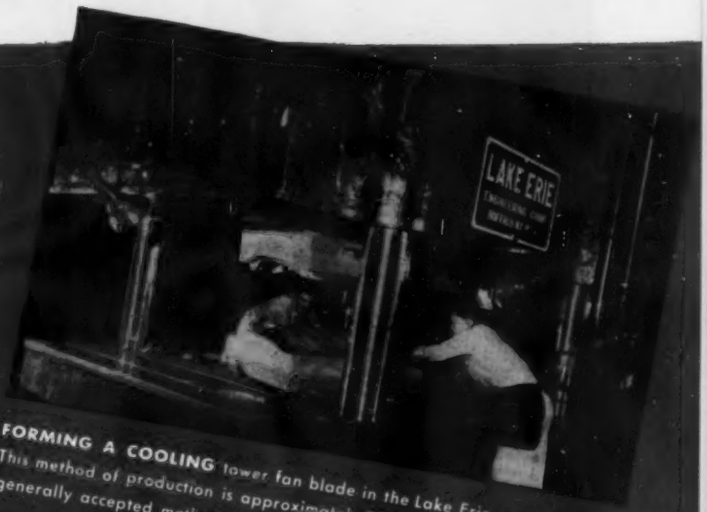
303 W. LEHIGH AVE., PHILADELPHIA 33, PA.

Service and Sales in all Principal Cities

1,000 TON LAKE ERIE Hydraulic Press in the Solar Aircraft Company plant in San Diego, Calif. The press is a self-contained, column type, double action unit with double platens. Platen dimensions are 146" right to left, 85¼" front to back and 66" x 60" for the cushion platen. The press has a 36" stroke and 49" daylight opening.

SOLAR AIRCRAFT
produces cooling tower fan blades 25% faster
with LAKE ERIE Hydraulic Press

There is a sound, economic reason why so many well-known manufacturers are installing the latest hydraulic presses. In plant after plant, these automatic and semi-automatic presses are increasing production, improving product quality and lowering unit costs. The experiences of the Solar Aircraft Company are typical of the advantages enjoyed by countless manufacturers in the automotive, farm equipment, home appliance, electrical and other fields where these high-speed presses are at work. The advantages are worthy of investigation. A good way to get the facts quickly is to consult Lake Erie's engineering staff. They'll be glad to assist you without obligation.



FORMING A COOLING tower fan blade in the Lake Erie press. This method of production is approximately 25% faster than other generally accepted methods.

THE LAKE ERIE PRESS turns out a more uniform blade of higher quality at a lower unit cost.

THE LAKE ERIE PRESS is also used to manufacture many other products including stainless steel side panels, bottoms and ends for caskets, which are produced at the rate of from 35 to 60 per hour.

LAKE ERIE ENGINEERING CORP.

MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY

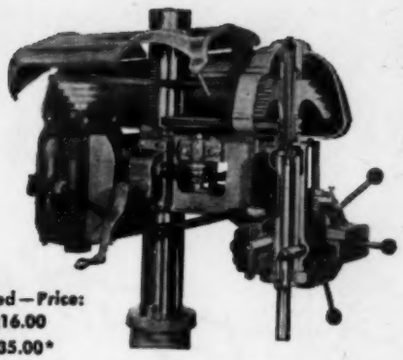
★

General Offices and Plant:
507 Woodward Avenue, Buffalo 17, New York

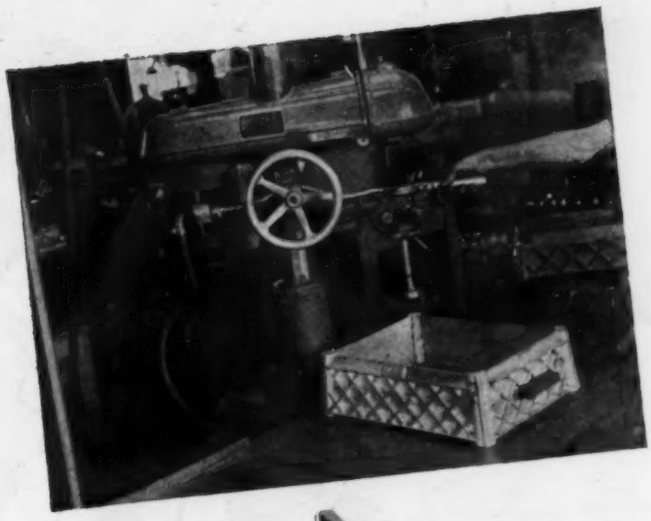
OFFICES IN PRINCIPAL CITIES AND FOREIGN COUNTRIES

LEADING MANUFACTURER OF HYDRAULIC PRESSES—ALL SIZES AND TYPES—METAL WORKING...PLASTICS MOLDING FORGING...METAL EXTRUSION....PROCESSING....RUBBER VULCANIZING...STEREOTYPING...SPECIAL PURPOSE

GORHAM
is a name to remember
GORHAM
—when you're thinking of "special" tools
"Special" in more than the usual sense of the word are these cemented carbide cutting tools by GORHAM. Whatever your needs in custom-built tools, the name GORHAM means highest quality. Our engineers are experts in the design, application and manufacture of carbide-tipped cutting tools. When you want a "special" tool for a special job, call GORHAM to solve your problem. Our long experience in the field will help you do the job faster, better, more economically. The facilities of our modern plant are at your disposal.
GORHAM TOOL COMPANY
14400 WOODROW WILSON AVE. • DETROIT 3, MICHIGAN



Model D-1101X Power Feed—Price: less motor and column $216.00
D-1100X Hand Feed—$135.00*



FOR EXAMPLE

HINES FLASK COMPANY SOLVES GRINDING AND DRILLING PROBLEM

INCREASES PRODUCTION 500%

WITH WALKER-TURNER 20" DRILL HEADS

The hand chipping of sprues from aluminum castings created bad working conditions . . . holding foundry flasks by hand and drilling corner holes with vertical presses caused inaccuracies—these were the production difficulties at the Hines Flask Company, of Cleveland, Ohio.

Both problems were overcome through the flexibility of Walker-Turner 20" Drill Heads. Equipped with an abrasive wheel, they ground down sprues with minimum effort and noise—*production went up 500%*. Placed in a special fixture designed by Hines, they made it easy to drill holes of dependable accuracy—*drilling production went up 100%*.

Such are typical advantages gained from Walker-Turner Machine Tools. These high-capacity, low-investment units are flexible as to mounting, speeds and control. They handle all types of materials, perform many operations.

Whether used to meet unusual requirements, to free costlier equipment for other work, or to handle routine operations, Walker-Turner Machine Tools pay for themselves within a few weeks. *For complete catalog, write to Walker-Turner Company, Inc., Plainfield, New Jersey.*

Photo, upper right: Using a Walker-Turner 20" Drill Press to do a surface grinding operation on aluminum flasks in radial motion.

Photo, lower left: Drill Head horizontally mounted. Work holding set-up locates work quickly; angle holes are drilled accurately.

* **Photo, upper left:** 20" Power Feed Drill Press Head, Model D-1101X, Hand Feed Model D-1100X. 4 ball bearings, 6" spindle travel. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Capacity 1" in cast iron, ¾" in steel. Slo-speed motor optional.

walker-turner MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS
RADIAL SAWS • BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

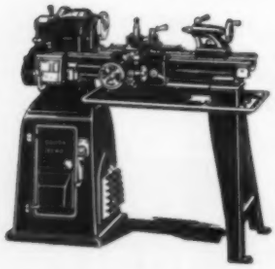
SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

YOU CAN'T WIN THE DERBY WITH A PLOW-HORSE

And using heavy machine tools for light, fast jobs is just as inappropriate. Your production costs just can't stay in the running when this is done. Yet, the mismatching of machines and jobs is common.

You should investigate South Bend Lathes if you are machining small, precision parts. This is the type of work for which they are built. Their speed of operation and ease of handling make possible fast machining. Their precision speeds close tolerance work. And the fine finishes they produce often eliminate additional operations.

Use South Bend Lathes for low-cost machining of small parts . . . and put the production "plow-horses" back on the jobs for which they were intended. Write for Catalog 100-F.



10" Quick Change Gear Lathe

South Bend Quick Change Gear and Toolroom Lathes are made with 9" to 16" swings. Precision Turret Lathes with ½ inch and 1 inch collet capacities.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA

BUILDING BETTER LATHES SINCE 1906

Truarc inverted rings align shafts, save 20 minutes . . . . $1.00 per unit

Production savings and sales advantages result from redesign with four Truarc rings

- Eliminate two drilling, two tapping operations, and the fabrication of two collars and four pins.
- Eliminate two set screws.
- Cut dis-assembly, re-assembly time 75%.
- Make for closer tolerances.
- Make drive shaft self-aligning: operation by user greatly simplified.
- Make more delicate adjustments easier for user.
- Streamline entire unit.
- TOTAL OVERALL SAVINGS, per unit . . . $1.00

Elevator-rod detail of Skyview Condenser Enlarger, where Truarc Inverted Retaining Rings provide uniform shoulder for abutting curved surface of helical spring, improve product.

Like the Skyview Camera Company of Olmsted Falls, Ohio, re-design with Truarc and you will cut costs and improve your product too. Wherever you use machined collars, nuts, bolts, snap rings, cotter pins —there's a Truarc ring that does a better job of holding parts together. All Waldes Truarc retaining rings are precision engineered, easy to assemble and dis-assemble, retain circularity always to give you a never-failing grip. They can be used over and over again. Send us your problem. Waldes Truarc engineers will be glad to show how Truarc can help you.

WALDES

TRUARC

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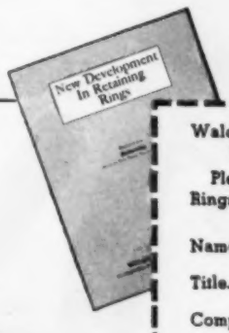
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,948; 2,026,454; 2,416,852 AND OTHER PATS. PEND.



● *Send for new Truarc booklet, "New Development In Retaining Rings"*

Waldes Kohinoor, Inc., 47-10 Austel Place 12W
Long Island City 1, N. Y.

Please send booklet, "New Development In Retaining Rings" to:

Name_____

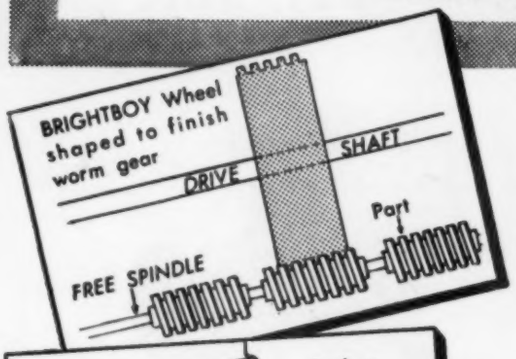
Title_____

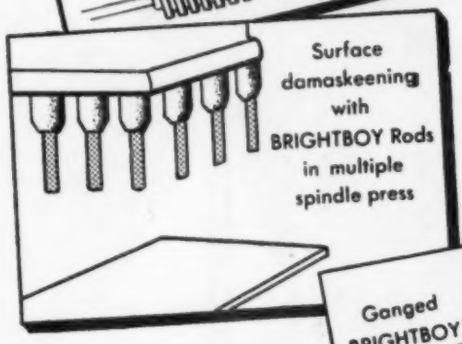
Company_____

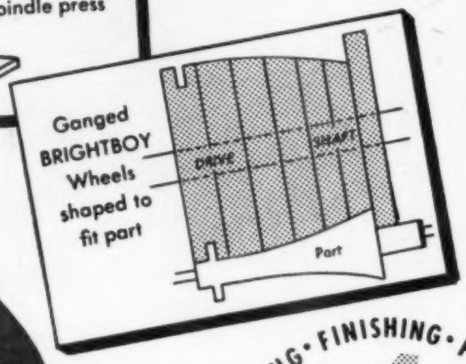
Business Address_____

City_____ Zone_____ State_____

Up Against Price Competition . . . ? Rising Costs . . . ?







Somewhere in your production setup Brightboy can combine your contouring, burring, finishing, smoothing and polishing into ONE TIME-SAVING OPERATION—cut your costs—improve your product—enhance its appeal.

You will appreciate this new conception of precision finishing—THE COMBINING OF RESILIENT RUBBER AND ABRASIVE to achieve so many operations in one—so many attractive surfacing effects on so many materials; STEEL, BRASS, COPPER, WOOD, PORCELAIN, PLASTICS.

Ask your dealer for the Brightboy catalog manual and prices. Write us on specific finishing problems; a Brightboy production specialist will call without obligation.

BURRING • FINISHING • POLISHING

IN ONE OPERATION

BRIGHTBOY INDUSTRIAL DIVISION

Weldon Roberts Rubber Co.,

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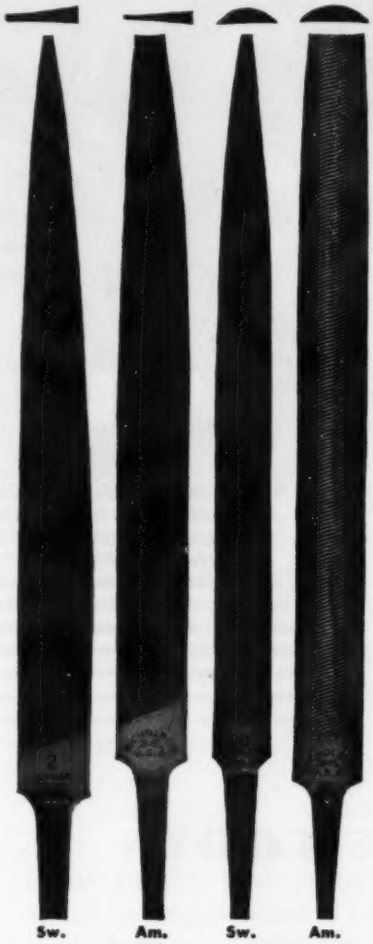
WELDON ROBERTS

Brightboy

"PRECISION FILES FOR PRECISION WORK"

is a rule that pays off well in better results, fewer rejects, lower costs. This is one of a series of advertisements on special-purpose files. Save it for shop use and purchasing reference.

Subject: SWISS PATTERN FILES — Prepared by Nicholson File Co.



Typical comparisons of Swiss and American Pattern Files—Knife and Half Round shapes

Die making with Swiss Pattern Files

DIFFERENCE BETWEEN SWISS PATTERN AND AMERICAN PATTERN FILES

Nicholson X.F. Swiss Pattern Files are manufactured in accordance with the original Swiss designs or patterns and differ in a number of respects from American Pattern Files. Swiss Pattern Files were first made for jewelers, watchmakers and fine toolmakers. Today they are used wherever superfine precision filing is required.

Although the cross-sections of some Swiss Pattern and American Pattern Files are similar, many of the shapes are different. Other important differences are: (a) Swiss Pattern Files are made to more exacting measurements. (b) Their points are smaller and the tapered shapes have a longer taper. (c) They come in *seven* degrees of coarseness, against the three usually supplied in American Pattern.

USES. Swiss Pattern Files are used extensively in automotive and aircraft factories; in die-casting plants; by makers of delicate instruments and optical goods; by workers on precious metals; for finishing and dressing dies of all kinds; for wood and ivory carving; and for model making.

These files are primarily finishing files and in general are used for removing burs left from previous machinery operations, rounding out slots, smoothing up small parts, and final finishing on all sorts of delicate and intricate pieces.

SPECIAL GROUPS. The Nicholson X.F. Swiss Pattern line includes such special-purpose groups of files as: Die Sinkers Files; Round and Square Handle Needle Files; Filing Machine Files in various shapes, sizes and types; Silversmiths and Die Sinkers Rifflers. Individual types include: Crochet, Barrette, Slitting, Crossing, Pippin, Joint, Screw Head, Warding, Equaling, Pillar (in three standard widths).

WRITE FOR *"FILE FILOSOPHY"*—FREE 48-PAGE BOOK ON FILES

NICHOLSON FILE COMPANY, 29 Acorn Street

EXTRA — TRADE X.F. MARK — FINE

PROVIDENCE 1, RHODE ISLAND

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NICHOLSON FILES *FOR EVERY PURPOSE*

OF FINE TOOLS

WHITMAN & BARNES is pardonably proud of having reached the age of 100 years! Its pride is further heightened by the knowledge that without the continuous loyal support of its customers, this record could not have been made possible. . . . To carry on as an active manufacturer, an institution like Whitman & Barnes must build products which when placed into use, perform so well that appreciative customers will buy them again, and again, and again. . . . To its customers who buy and use the drills, reamers, and punches it makes, Whitman & Barnes gives deserving credit for having assisted it to bring to a conclusion its first one hundred years of service to industry.

There is a "W & B" distributor near you.

W&B

WHITMAN & BARNES

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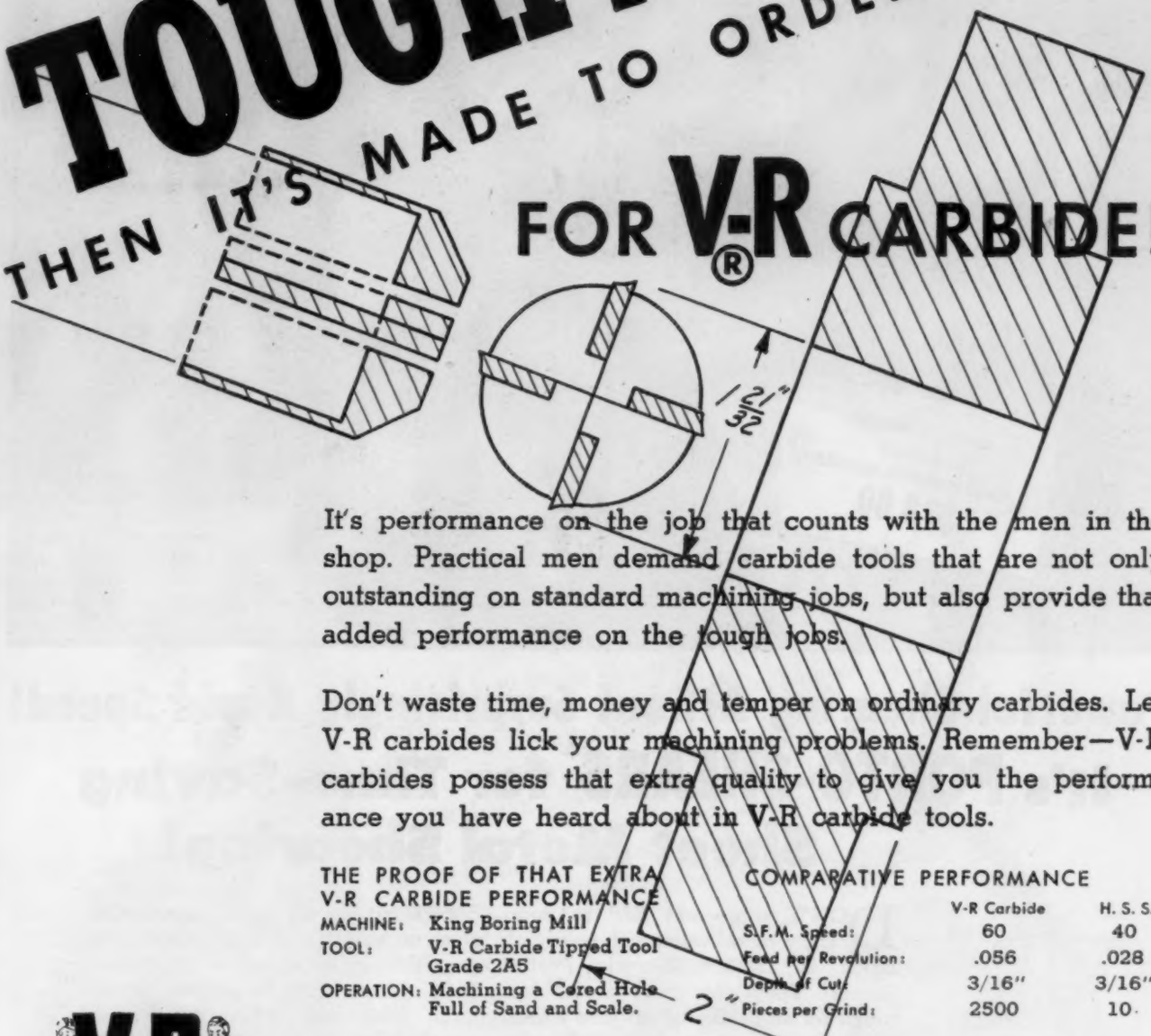
TOUGH?

THEN IT'S MADE TO ORDER FOR V-R® CARBIDE!



It's performance on the job that counts with the men in the shop. Practical men demand carbide tools that are not only outstanding on standard machining jobs, but also provide that added performance on the tough jobs.

Don't waste time, money and temper on ordinary carbides. Let V-R carbides lick your machining problems. Remember—V-R carbides possess that extra quality to give you the performance you have heard about in V-R carbide tools.

THE PROOF OF THAT EXTRA V-R CARBIDE PERFORMANCE

MACHINE: King Boring Mill
TOOL: V-R Carbide Tipped Tool Grade 2A5
OPERATION: Machining a Cored Hole Full of Sand and Scale.

COMPARATIVE PERFORMANCE

	V-R Carbide	H. S. S.
S.F.M. Speed:	60	40
Feed per Revolution:	.056	.028
Depth of Cut:	3/16"	3/16"
Pieces per Grind:	2500	10

REMARKS: 60 SFM is top speed of the machine. Little tip wear apparent at end of run. Another 2500 pieces could be run before grinding would be necessary.

KEEP UP TO DATE ON V-R CARBIDE TOOL GRADES AND THEIR APPLICATION! Write or call your nearest Vascoloy-Ramet Field Engineer for information about V-R carbide's outstanding performance on stainless steel, steel alloys, non-ferrous and non-metallic applications.

SEND for your free copy of the NEW VR-400 Carbide Tool and Blank Catalog. 32-pages of vital carbide engineering information. Address Dept. TC547.

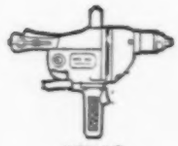
VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS

District Sales and Service in Principal Cities

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

Powerful Shearing Action! Surprisingly Rapid Speed!

It's PORTO-SHEARS* for Time-Saving Sheet Metal Shearing!


DRILLS

SANDERS

PORTABLE GRINDERS

SCREW DRIVERS

BENCH GRINDERS

DON'T snip—add *ZIP* to your sheet metal work with powerful Black & Decker Electric Porto-Shears! They cut sheet metal too tough for snips. Speed up jobs where snips are slow. Feed easily with only a light forward pressure. Easier to follow straight lines, irregular patterns, curves down to 3/4" radius without fear of rejects, because *cutting action is always visible.*

Black & Decker 16-Gage Porto-Shears cut up to rated capacity in steel or galvanized iron—about one gage thinner in Monel or stainless—50% above rating in copper, aluminum, lead and other non-ferrous metals. Can be adapted to cut thin sections of laminated wood or sheet plastics. Ask your nearby Black & Decker Distributor for details. Write for free catalog to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

GROUND FROM THE SOLID
BATH
TRADE MARK
JOHN BATH CO.

IT TAKES SOMETHING EXTRA TO BE A *Specialist!*

It takes long hours of instruction . . . constant practice, to develop the finished technique and artistry of the ballet dancer!

Special skills . . . years of experience go into the design of BATH ground thread taps . . . ground to exact specifications for stock and special sizes . . . toughened by hardening and tempering — then ground from the solid!

The technique of master craftsmen is essential in fashioning BATH taps for extra long wear . . . for the threading of many metals under varied conditions and with many types of machine equipment.

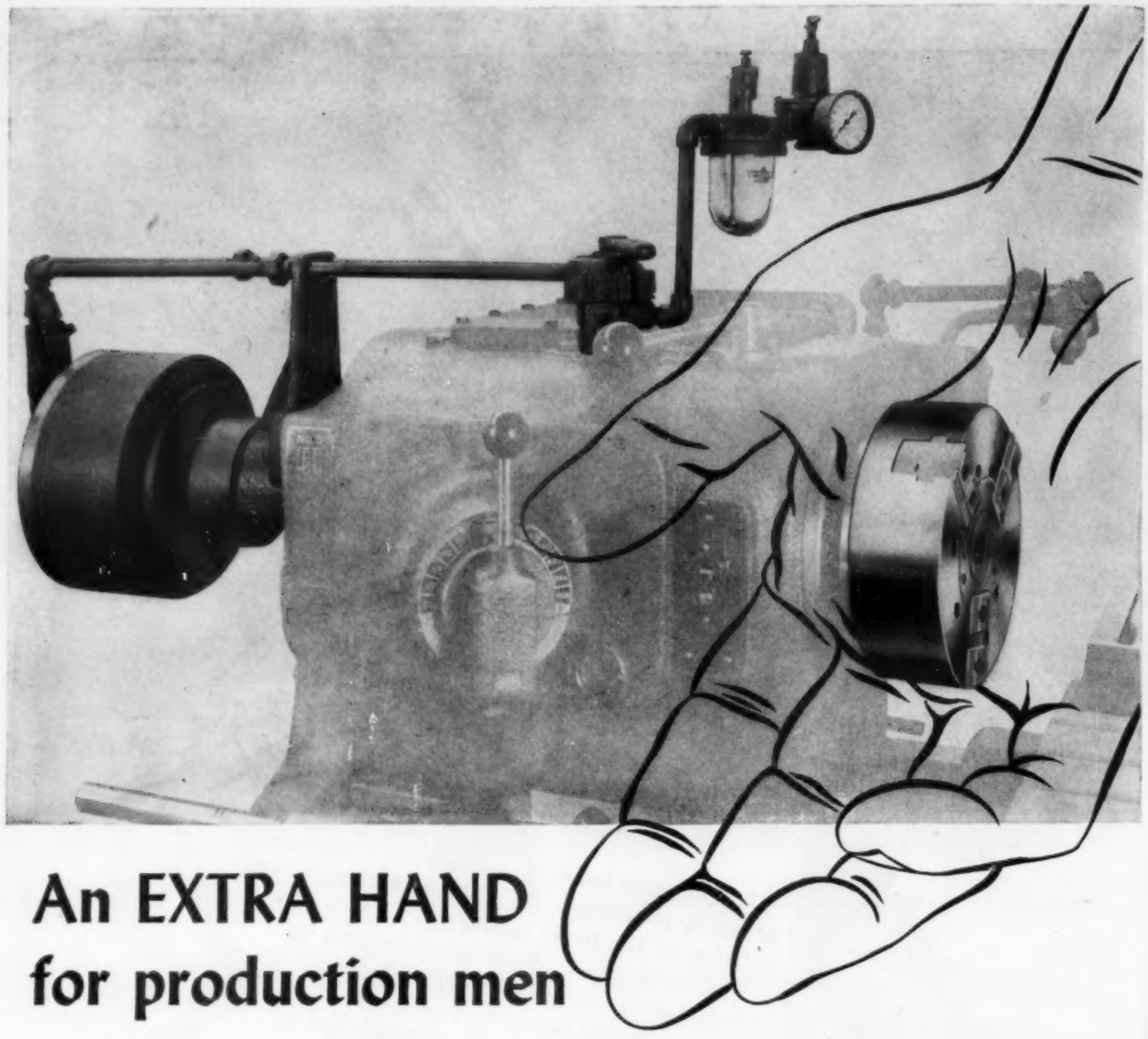
BATH workmen are professionals in precision! Look for the name BATH on the tap shank . . . it's a distinctive mark of quality and economical performance. See your BATH representative or write direct about your tap problems.

(Transportation is paid to your plant on all Bath products)

JOHN BATH CO.
INCORPORATED

22 Grafton Street
WORCESTER 8, MASS.

GROUND THREAD TAPS • PLUG AND RING THREAD GAGES • INTERNAL MICROMETERS



An EXTRA HAND for production men

Skinner Power Chucks and power chucking equipment give a production bonus to any turning equipment. In this day of high production, they give a hand where it is needed most.

1. They increase production by reducing the chucking time.
2. They help eliminate operator fatigue.

Production men also appreciate this extra hand—that increases output—that reduces cost.

Skinner Power Chucks, *the simplest Power Chucks made,* have but four moving parts—a wedge and three jaws. This guarantees accuracy throughout a long life and eliminates costly maintenance. The special wedge angle, developed by Skinner, gives tremendous gripping power and unusual safety. *Once a Skinner Power Chuck grips the work, it will not release even if the air is completely cut off! It will hold positively, under the heaviest cuts and highest speeds, until the operator wishes to remove the work piece.*

Complete details on Skinner Power Chucks, rotating and non-rotating air cylinders, valves, filters and all other Skinner chucking and vise equipment are contained in Catalog No. 60. Write for your free copy today.

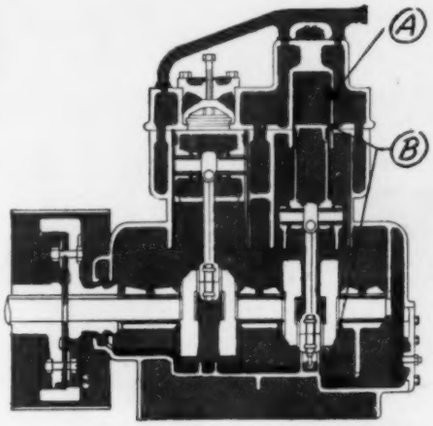
The Skinner Chuck Co.
343 CHURCH STREET, NEW BRITAIN, CONN.

Skinner Chucks

SKINNER CHUCKS
THE CREST OF QUALITY

HAND & POWER OPERATED MACHINE CHUCKS – AIR CHUCK EQUIPMENT – FACE PLATE JAWS – MACHINE VISES

CASE 1045--MINIMIZING OIL OXIDATION AND DEPOSIT TROUBLE IN AIR COMPRESSORS.



TWO-STAGE, 2 CYLINDER AIR COMPRESSOR

In air compressors of all types and sizes, heat-resistant Calol Multi-Service Oil materially reduced deposits on discharge valves, cylinders, bearings and in crankcases. Comes in six viscosity grades: 45X, approximately SAE 10; 50X, SAE 20 medium; 55X, SAE 20 heavy; 65X, SAE 30; 75X, SAE 40; 85X, SAE 50.

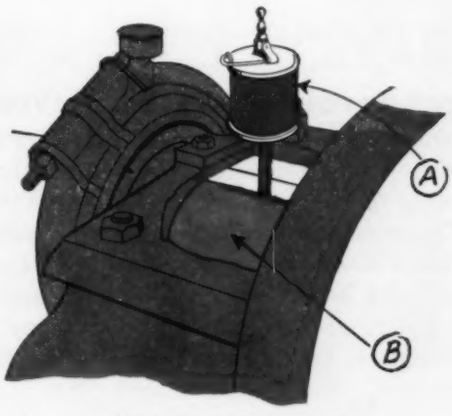
A. Detergent compound keeps parts cleaned of gum and lacquer and prevents ring sticking . . . provides constant lubrication on hot spots.

B. Oxidation inhibitor prevents formation of sludge and other deposits caused by air, extreme heat, moisture, dust and other contaminants.

Has high metal-adherent quality - maintains film of oil in idle machines which prevents starting wear and protects against rusting.

Calol Multi-Service Oil will correct gum and lacquer problems in many machines - in air compressors, Diesel and natural gas engines, enclosed gears, bearings.

CASE 1063—REDUCING CONSUMPTION OF OIL USED FOR GENERAL INDUSTRIAL LUBRICATION.



STEAM ENGINE MAIN BEARING

In severe lubrication conditions, such as in the main bearing of a steam engine, consumption of compounded Calol Red Engine Oil X was 20 to 30 percent less than that of straight mineral oil. It is recommended for all types of bearings except high-speed, flood lubricated, anti-friction bearings where pickup may be excessive. Comes in three grades: 13X, 16X and 26X.

A. May be applied by all types of oiling systems - compounds promote better circulation in ring-, and chain-oilers.

B. Contains stringiness and oiliness additives. Forms tacky "oilskin" on bearings - resists heavy loads and high temperatures. Reduces friction, high starting torque and wear.

Calol Red Engine Oil X has excellent metal-wetting ability - protects metal against rusting even in high humidity conditions. Cools rapidly.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
30 Rockefeller Plaza, New York 20, N. Y.

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

RPM CALOL

Trademarks Reg. U. S. Pat. Office

If a degreasing problem has you on edge...

Call your Du Pont Solvent Distributor

You'll get personal service, promptly. You'll get practical advice and help from experienced men who know solvents and the equipment in which they are used. You'll get field tests in your plant, to get quick answers. You'll get the skilled assistance of the Du Pont technical representatives and Du Pont research and technical laboratories if they are needed.

So, if things aren't working out the way you think they should . . . if you feel that your solvent losses are too high . . . that you're not getting the best results from equipment or solvent . . . just call or write your Du Pont distributor. You'll get quick action.

ABOUT DU PONT DEGREASING SOLVENTS

Under various trade names, Du Pont Trichlorethylene and Perchlorethylene solvents for metal cleaning have been in wide use for many years. They are the best Vapor Degreasing solvents we've ever made—the best we know how to make. Use them with complete confidence and assurance for all metal degreasing work. E. I. du Pont de Nemours & Company (Inc.), Electrochemicals Department, Wilmington 98, Del.

Tune in to Du Pont "CAVALCADE OF AMERICA," Monday nights—8 p. m. EST, NBC

DU PONT SOLVENTS for VAPOR DEGREASING

SOLD NATIONALLY THROUGH DISTRIBUTORS

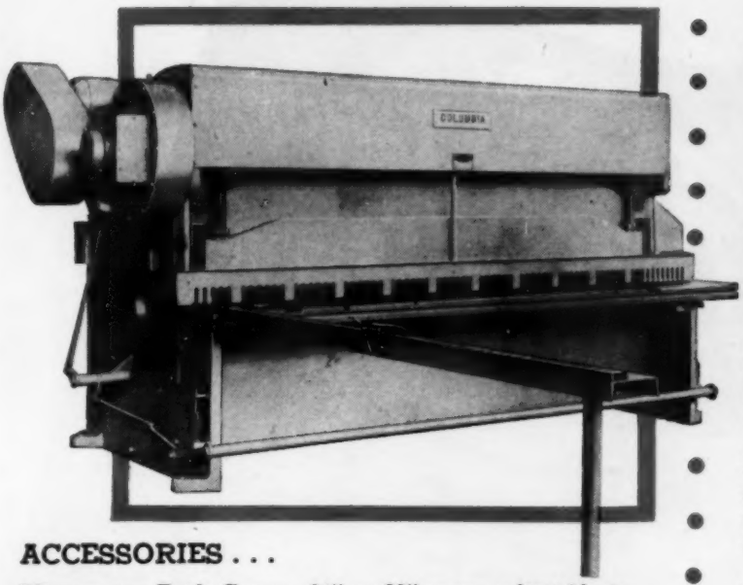
DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

IMMEDIATE DELIVERY

Columbia STEEL SQUARING SHEARS



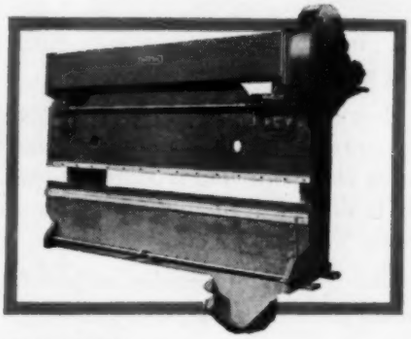
ACCESSORIES . . .

Micrometer Back Gauge, 24" or 36" range, adjustable in sixty-fourth inches. Provision for taper shearing. Front or back operation.

Squaring Arm of ten-foot-range, with steel scale and adjustable folding gauge finger, for use on either end of the shear.

Front Gauge with 50" range.

POWER PRESS BRAKES



Columbia Power Press Brakes, for forming mild steel, 4 to 10 feet, in 3/16" to 7/16" gauges, offer many cost-cutting advantages.

Write for Bulletins

COLUMBIA MACHINERY AND ENGINEERING CORPORATION

HAMILTON, OHIO

with all these ADVANCED DESIGN FEATURES

Greatly increased production which makes Columbia one of the nation's largest shear manufacturers makes possible IMMEDIATE DELIVERY of new post-war Columbia Steel Squaring Shears with all important design improvements you need for greatest shearing speed, accuracy and economy. It will pay you to investigate the experience of hundreds of Columbia users before buying. Note these Columbia features:

- **LONGER SHEAR BLADES** than are normally required for cutting full width of material eliminate tearing or nicking when notching or trimming sheets longer than blades.
- **ADJUSTABLE UPPER BLADE HOLDER** has a heavy brace with provision for readily adjusting horizontal alignment of blade.
- **RIGID STEEL CONSTRUCTION** of the base, housing, table, slide, top cross tie, etc., for maximum strength, durability and precision.
- **GEARS OPERATE IN OIL.** Steel gears, precision machine cut, operate in an oil-tight case.
- **SOLID, POSITIVE CLUTCH** has six alloy-steel jaws with hardened faces. Automatic stop cam.
- **HEAT-TREATED, FORGED ECCENTRIC SHAFT** — eccentrics forged integral with shaft.
- **MECHANICALLY-OPERATED AUTOMATIC HOLD-DOWN** has individual high-compression spring compensating fingers, insuring unfailing operation.
- **STAINLESS STEEL SCALES.** Non-rusting, easily-read.
- **CENTRALIZED LUBRICATION** for adequate, dependable lubrication to main bearings.
- **FINGER GUARD** in front of the shear blades.
- **CAPACITY.** 10 and 12 foot models will shear 3/16" mild steel at 60 strokes per minute. Six-foot models will shear 1/4" mild steel at same speed. Standard throat depth, 18 inches.

Positive lubrication may solve that Problem Draw!

TRY
Bonderizing
AS AN AID IN DRAWING
Aids Drawing (8 Ways)
1 Provides positive lubrication and permits use of a wider range of lubricants
2 Permits deeper draws
3 Reduces material breakage and rejects
4 Reduces metal-to-metal contact
5 Prolongs tool life
6 Allows wider variation in steel composition and heat treatment
7 Reduces number of process anneals
8 Gives smoother finish to final drawn product

Before you give up on that tough draw, try Bonderizing!

On numerous problem draws, treatment of the work on the Bonderite line has been the answer to smooth, easy drawing.

The Bonderite coating has a great affinity for oil, holding it even under great pressures, thus providing positive lubrication. The nonmetallic crystals of the Bonderite act as a cushion between work and tools, as they are crushed and glazed in the drawing operation. Because Bonderite is nonmetallic, it functions as an anti-flux, greatly reducing galling and scoring.

In seamless steel tube mills, and on production drawing operations in many other plants, Bonderizing as an aid in drawing is being used with great success. It offers advantages in speed, economy, and results.

Write today for full information on how Bonderizing can aid you in solving your drawing problems.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

Parker

PARKER RUST PROOF COMPANY
2156 East Milwaukee Ave.
Detroit 11, Michigan

BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces

SNOW FULL UNIVERSAL TAPPING MACHINE

12-24 TAP-2 HOLES
DATA FOR TAPPING OPERATION:
OPERATION: TAPPING 2 HOLES-5/16" DEEP THROUGH-12-24 TAP
MACHINE: NO 2 UT.-"SNOW" UNIVERSAL TAPPING MACHINE
FIXTURE: NO 557 DIAL FIXTURE
MATERIAL: DIE CAST ALUMINUM
MANUFACTURING CO.
LOCK BODY

The SNOW Full Universal Tapping Machine is complete with electric controls, motor driven lubricant pump, air operated table lift, and dirt and moisture trap.

All types of air operated indexing and clamping fixtures and jigs can be instantly synchronized with the cycle of the machine. The electric controls provide various types of operation to suit any specific tapping problem. Extreme sensitivity in the application of power eliminates tap breakage, and allows class 3 and 4 fits to be obtained at no loss in production.

Years of experience and thousands of installations enable us to assist you in any of your tapping requirements. Submit blue prints and sample parts for specific recommendations, production estimates, and tooling data.

FULL UNIVERSAL TAPPING, DRILLING AND THREADING MACHINES

SNOW MANUFACTURING COMPANY

437 EASTERN AVE., BELLWOOD, ILL. • SUBURB OF CHICAGO

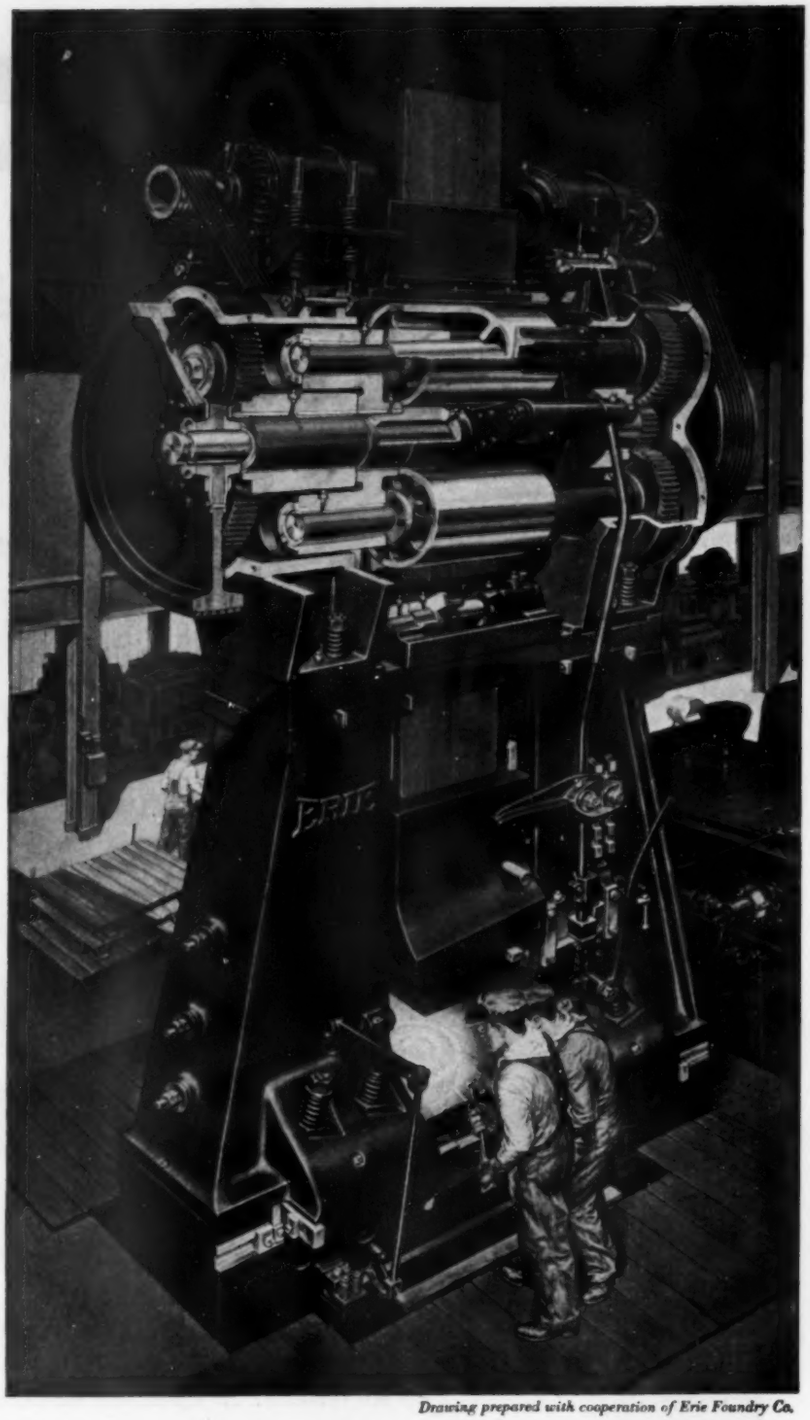
Inside Knowledge on Lubrication Problems

—SHOCK LOADS—

This is One of a Series of Messages on Common Problems in Your Plant

Squeeze! ..Grab! ...Lift!

—and terrific shock loads for oil and grease!



Drawing prepared with cooperation of Erie Foundry Co.

No NEED to tell you about the slugging punishment that this board hammer hands out in forging tough steel! The impact force of each blow may be as high as 7,000,000 lbs. But what you may not know is the punishment it also gives to oil and grease.

Every time the ram is raised, eccentric rollers squeeze the lifting rolls against the board with a total force of 60,000 lbs. As the rolls grab and the ram is lifted, a terrific shock load is thrown on the gear teeth and bearings.

Only thin films of oil and grease, applied intermittently, protect these highly stressed surfaces. If these films fail, the result is scoring and wear.

Yet Correct Lubricants by Socony-Vacuum stand up! For the gears and pinions, and the eccentric chamber, Gargoyle Compounds cling tenaciously to the metal, resist rupture under heavy shock loads. For the eccentric and roll bushings, Gargoyle Grease Sovarex L gives the same protection, resists leakage that may result in board slippage. For the ram guides, Gargoyle Viscolite Oils adhere tightly in spite of high impact stresses.

Get these proved lubricants in your board hammer now!

SOCONY-VACUUM OIL COMPANY, INC.
and Affiliates: MAGNOLIA PETROLEUM CO.
GENERAL PETROLEUM CORPORATION

GARGOYLE Lubricants

SOCONY-VACUUM

Socony-Vacuum Correct Lubrication

FOR EVERY MACHINE ... EVERY OPERATING CONDITION

Gutenberg examining the first paper to be printed with movable type — about the middle of the 15th century.

KOOLPORE® was unheard of then!

Yes, there was no word about KOOLPORE grinding wheels on the first paper to be printed with movable type, but today there's plenty of good words about KOOLPORE — both in print and throughout industry.

These BAY STATE abrasive products, with their large pore spaces, are giving an outstanding performance on countless SURFACING and TOOL and CUTTER JOBS that require extra coolness of cut, and fast, heavy removal of metal.

Here's 5 features that make KOOLPORE grinding wheels superior:

1 — Faster Cutting
2 — Cooler Cutting
3 — No Chip Jam
4 — Greater Clearance
5 — Increased Production

Write for Koolpore folder which includes specifications.

Branch Offices and Warehouses — Chicago — Detroit
Distributors — All Principal Cities

BAY STATE®

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASSACHUSETTS, U. S. A.

KEEPING PACE

For 40 Years **Geargrind methods of Formed Wheel Grinding have constantly been perfected and improved—to keep pace with advancing production techniques and refined tolerances. Geargrind Machines are serving industry throughout the world, wherever accuracy, speed and finish are demanded.**

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH., U.S.A.

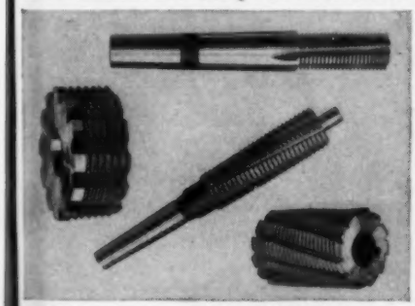
The Work Head Drive Governs Entire Automatic Cycle of Machine

A feature vital to machine operation, the work head drive rotates work spindle from which longitudinal and transverse cams are driven

through gearing. Provides feeds and rapid traverse, controlled by dogs from conveniently-located dog-wheel.

Accuracy of Cutter vital To Precision Threading

Hanson-Whitney Multiple Cutters, "finished" after hardening, hold spacing, form and relief to close limits. That is your assurance



of accurate, dependable thread milling . . . of long cutter life.

Examples of Threads Produced on 8" x 16" Model

Just a few examples of the precision threading jobs turned out on

this machine. Widely adaptable, the 8" x 16" H-W Thread Miller has external capacity of 8" diameter with 2½" cutter; internal capacity, 8" maximum diameter with 2½" cutter; 1" minimum diameter with 7/16" cutter.

HANSON-WHITNEY

FAST... ACCURATE... FLEXIBLE

SEMI-AUTOMATIC
THREAD MILLING MACHINES

Results tell the story . . . more accurate threading on an economical high speed basis! Hanson-Whitney Thread Millers assure the automatic production of perfect threads, eliminate costly spoilage . . . meet the demand for closer limits. Widely adaptable for straight or taper threads . . . internal or external . . . right or left hand. Multiple cutters finish threads in one revolution of work. Available in three sizes to answer diversified capacity requirements.

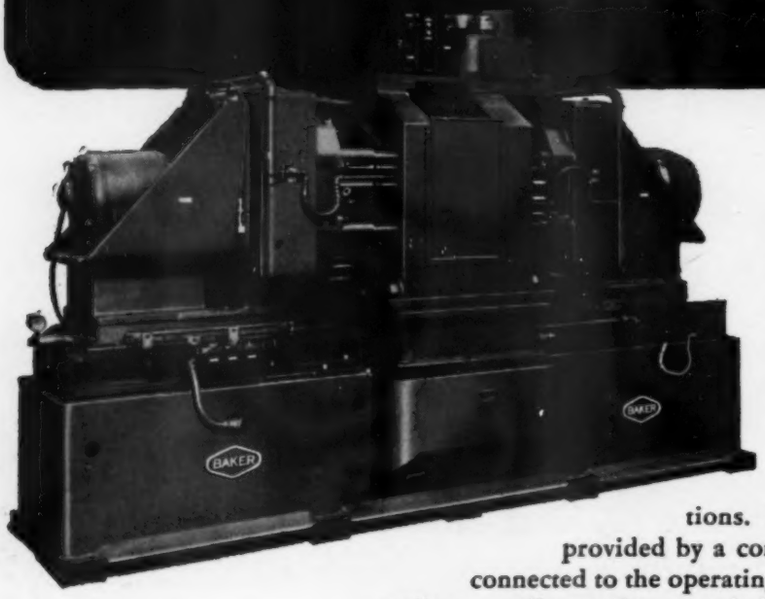
HANSON-WHITNEY MACHINE CO. HARTFORD 1, CONN.
Division of Whitney-Hanson Industries, Inc.

Write today for complete details that will help solve your thread production problem.

Hanson Whitney
PIONEERS OF FINISHED TAPS

(Advertisement)

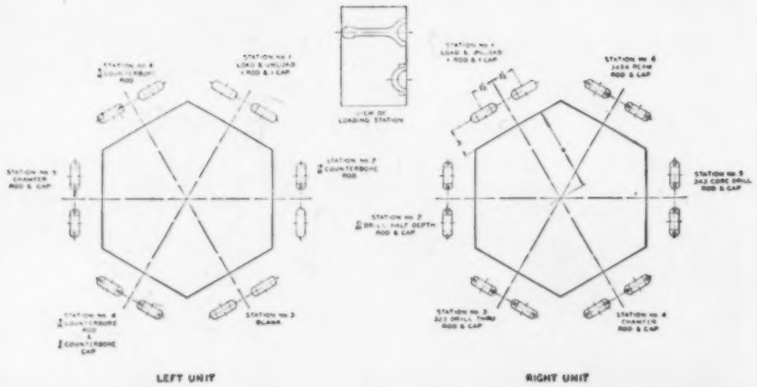
BAKER ... KEY TO Increased Productivity



TWO-WAY HIGH PRODUCTION MACHINE

High production machining of automobile connecting rods and caps is done faster on the illustrated new Baker two-way horizontal special floor-type machine. The right and left drilling units are standard model 15 x 16 hydraulic feed units that may be mounted in horizontal, vertical or angular planes with adaptability to single or multiple spindle operations. Hydraulic power for the 15 x 16 units is provided by a completely separate mobile pump sump unit connected to the operating cylinder of the machine by only two self-sealing couplings. Power unit is mounted on casters for easy exchange. For engineering data covering the 15 x 16 unit write for circular No. 69955.

Baker special high production machine with 15 x 16 units. Right unit drives a 20 spindle fixed center multiple head assembled with a self contained lubricant pump. Left unit drives a 12 spindle head. Machine is equipped with a six station automatic index trunnion arranged to clamp one automotive connecting rod and cap at each station. See illustration and diagram at right.



BAKER BROTHERS, Inc., Toledo, Ohio

DRILLING...TAPPING...KEYSEATING...CONTOUR GRINDING MACHINES

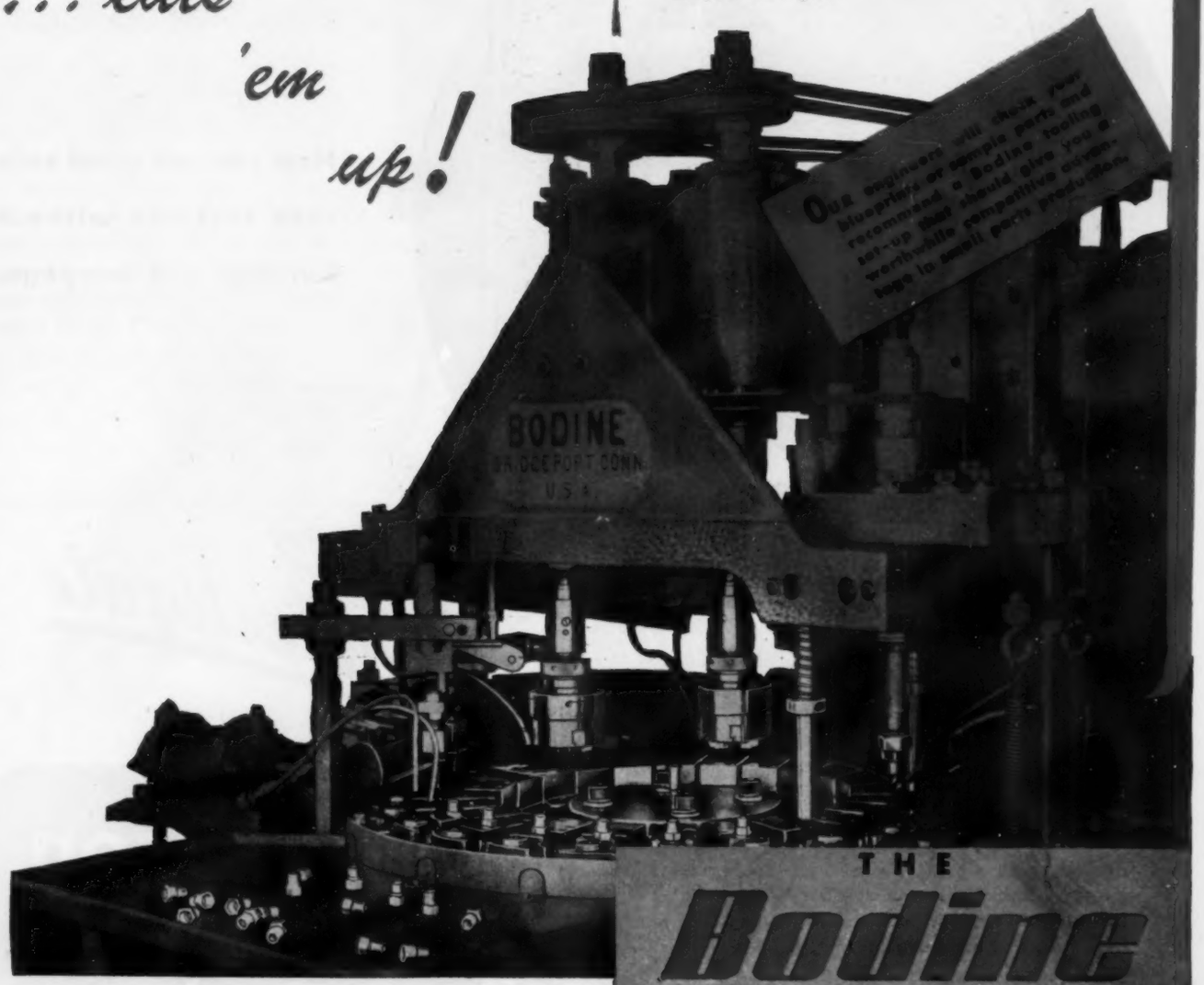
Bodine

HAS AN APPETITE FOR *Gadgets*

... eats 'em up!

THE versatility, accuracy and high speed of Bodine dial feed machines has been so well demonstrated that many plants requiring repetitive production of small parts, are replacing single process machines with these multiple spindle automatics.

Drilling, Milling, Tapping . . . and screw inserting, if desired . . . are performed during a single cycle of the horizontal indexing dial. A recent tooling for a specific job produced 70 operations per minute (drilling, counterboring, tapping), a result which formerly required several machines and 10 operators instead of one Bodine and one 21 year old girl.



SEND FOR BULLETIN AM, showing 6 sizes of machines, typical tooling, specifications.

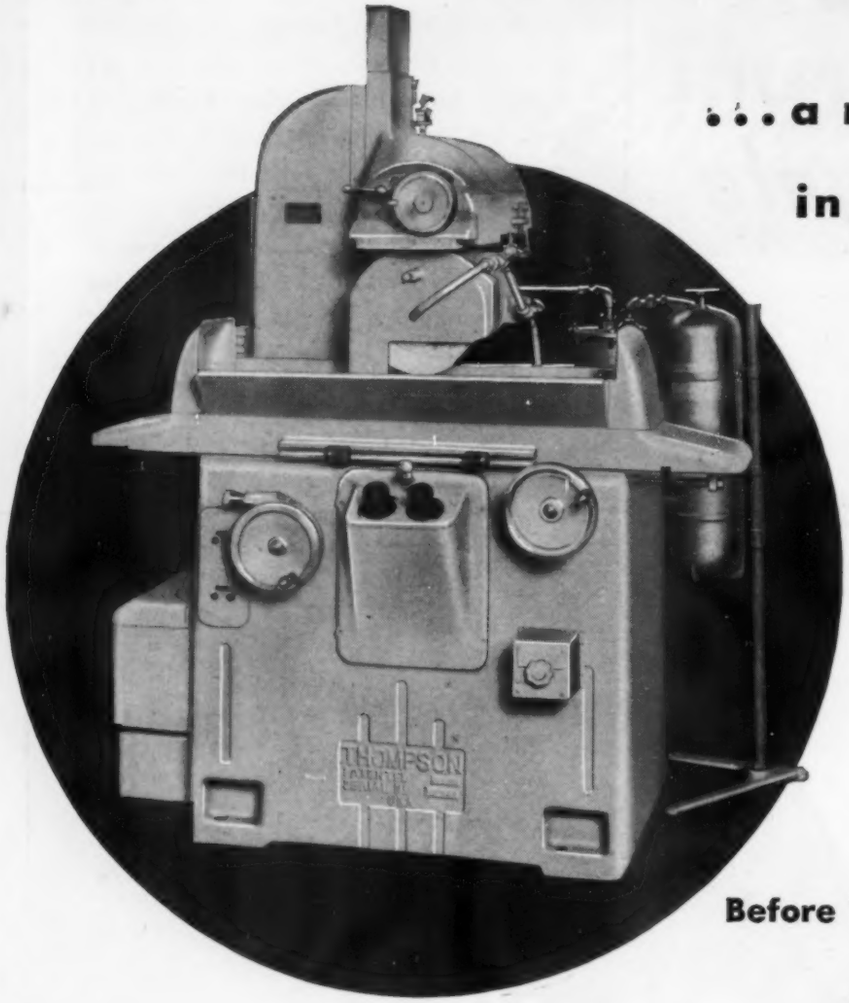
THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

ZBD48

COOLANT THROUGH WHEEL

GREATLY IMPROVES GRINDING METHODS



. . . a new development in surface grinding by THOMPSON

Now you can grind very thin sections without burning and warpage.

Before You Buy

Investigate

Thompson provides a full range of machine sizes from 6" x 18" to 36" x 240" utilizing the new principle of applying coolant to the grinding wheel. The new Thompson Type "F" Hydraulic Surface Grinder with coolant through the wheel is shown above. All of the coolant is applied through the grinding wheel, making it possible to grind exceedingly thin sections without burning or warping the work.

Very fine finishes are obtained to extremely close dimensions. An outstanding advantage of this patented process is gained in grinding blanking dies and other metal cutting or shearing tools. No amorphus metal is present after grinding. This increases the life of the tool between grinds.

WRITE TODAY **for details of this new process and for information on ways it can save you production time and money! Address Dept. 10, The Thompson Grinder Company, Springfield, Ohio.**

Thompson SURFACE Grinders

Copyright 1948—The Thompson Grinder Company

Jacobs Ball Bearing Super Chucks hold tools with the tightest practical grip ever devised. Progressive engineering and accurate, durable construction guarantee it. That's why Jacobs Chucks continue to lead the field. The Jacobs Manufacturing Co., Hartford 2, Connecticut.

Lines of beauty ...muscles of steel

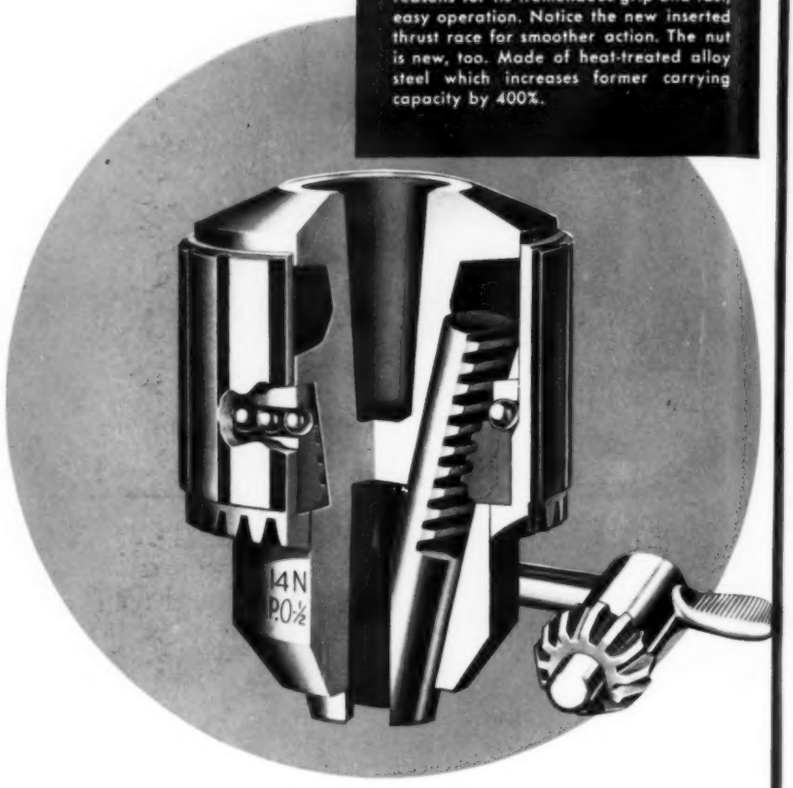
Jacobs Chucks

FOREMOST IN CHUCKS · FIRMEST IN GRIP

No other chuck holds so tight and true

Compare the grip of the Jacobs Ball Bearing Super Chuck with that of any other key-operated chuck. You'll find its tremendous gripping power is in a class by itself. In fact, you wouldn't even have to use its key to equal the grip of the others.

Yes, the famous Jacobs ball bearing construction gives you a *plus* in gripping power. In accuracy, too. Holds tools always on dead center. That's because precision craftsmanship keeps the jaws of the Jacobs Chuck parallel to closest tolerances throughout the entire tightening action.



This cutaway view of a Jacobs Ball Bearing Super Chuck shows some of the reasons for its tremendous grip and fast, easy operation. Notice the new inserted thrust race for smoother action. The nut is new, too. Made of heat-treated alloy steel which increases former carrying capacity by 400%.

Smoother, sturdier than ever

You know about the accuracy, gripping power, speedy operation and long life that have made Jacobs Ball Bearing Super Chucks so popular in the past.

Now something new has been added. An inserted thrust race with continuous deep groove lets the frictionless ball bearings do an even better job. A heat-treated alloy steel nut gives four times the load-carrying capacity of former construction . . . adds extra years of service life.

IF IT'S A

Jacobs

. . . IT HOLDS

For complete data

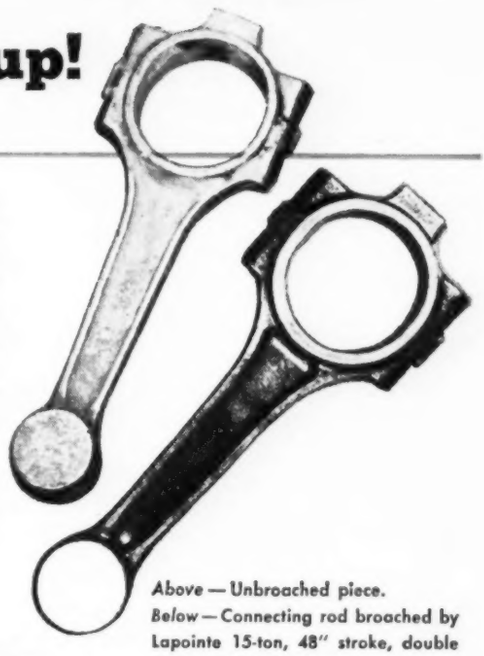
For full details about the way Jacobs Ball Bearing Super Chucks, made in 6 capacities from 0-¼" to ⅜-1", help you get more and better production out of drilling machines, lathes and screw machines, ask your INDUSTRIAL SUPPLY DISTRIBUTOR for Bulletin 48-N. The Jacobs Manufacturing Company, Hartford 2, Connecticut.

STOCKED BY YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

A Cinch for a set-up!

Face aligning operations in any shop can be a big headache because of the time required in setting up the pieces. A tilting fixture arranged by Lapointe Broaching Engineers completes the two-sided facing of motor connecting rods with every cycle on a standard double ram vertical machine. It's a *cinch* for the operator — the self-clamping and aligning fixture brings the connecting rod into absolutely correct position to finish broaching both faces at the same time, at the rate of 280 per hour.

If it is better precision and greater production you need, investigate broaching today. Its faster cutting action, backed by modern production methods, can make a big difference in your products. Write department 54.



Above — Unbroached piece.
Below — Connecting rod broached by Lapointe 15-ton, 48" stroke, double ram, vertical machine.

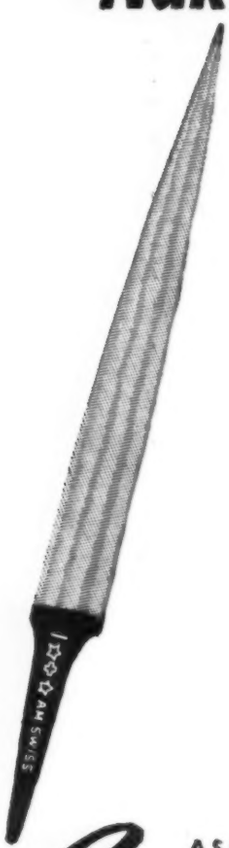
THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

"Naked-Eye" Inspection is not enough at AMERICAN SWISS



Have you seen an "American Swiss" inspector checking every detail of an "American Swiss" File under a magnifying glass. His job is to make sure each file is perfect in size, shape, cut and hardness. If he finds a flaw of any kind, the file is dropped into acid to make sure it will never be sold, for there is no such thing as a "second quality" "American Swiss" File for more than 45 years, the "American Swiss" standard has been "Only The Best Are Good Enough". Make that your "buy-word" when you need Swiss Pattern Files.

Buy from our Authorized Distributor.

AMERICAN SWISS FILE & TOOL CO.
410 Trumbull Street **Elizabeth 1, N. J.**

ASK FOR THEM BY THIS NAME

American Swiss ★★★

SWISS PATTERN FILES

DON'T LET "SET-UPS" GET YOU DOWN

SEND YOUR SPECIAL JOBS TO WALTHAM SCREW!

When special jobs bog down your production line, it costs you money. If you "set-up" three times for a job that could be done in one operation on modern, multiple-spindle automatics with special jigs and fixtures . . . it's time you learned about Waltham Screw Company and their "Special Job Shop Service."

We'll knock out those "special jobs" for you in "jig" time and at a fraction of the cost. We're set up to do it . . . and we're selling that service, reasonably.

Send us blue prints of your "problem" TODAY.

We quote prices that please even the most pennywise.

WALTHAM SCREW COMPANY
731 Rumford Avenue, Dept. B
WALTHAM, MASS.

DIE CUSHIONS

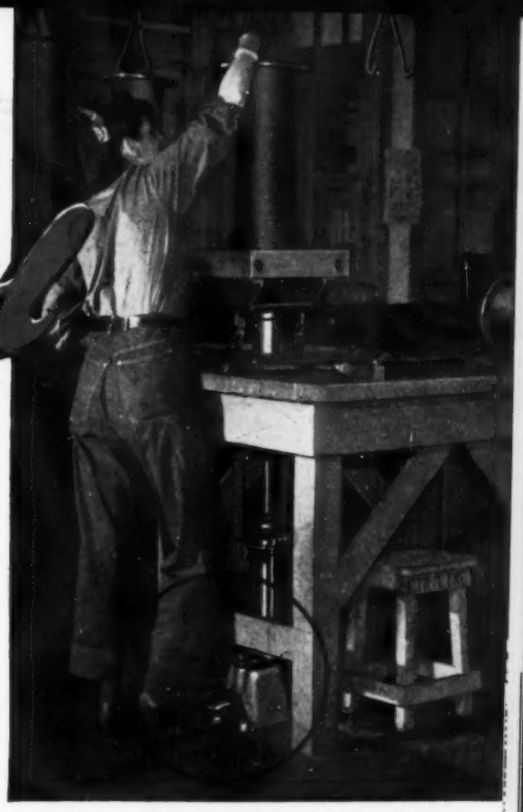
. . . for every punch press operation

DAYTON ROGERS MFG. CO.
Minneapolis 7, Minn.

Operator's Hands Left Free for Other Work...

...EXCLUSIVE PISTON LATCH* PERMITS

Dual Control FROM ONE TREADLE



Operator fatigue is minimized and the operator's hands left free for work requiring manual skill by using a Logan foot operated control valve.

IN NEW "LOGAN" † STANDARD *Foot Operated* VALVES

(AIR AND HYDRAULIC MODELS; 4-WAY, 2-POSITION TYPE)

To elevate these heavy castings in position for the conveyor, the operator momentarily presses the treadle of the Logan foot valve controlling the pneumatic mechanism. With the valve piston latch set for *indefinite dwell*, the elevating cylinder is held at the end of the outstroke until a conveyor hook can be attached to the part. The operator then presses the pedal again to lower the platform for receiving the next workpiece.

Conventional operation may be obtained from the same valve treadle by turning the lever to place the latching mechanism in neutral. The exclusive piston latch is available in Logan foot operated valves of both air and hydraulic types. Additional advantages are as follows:

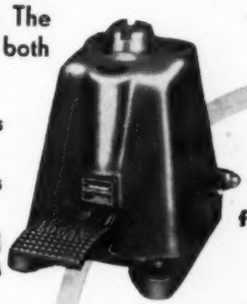
HIGHLY COMPACT—Only minimum floor space required. Valve bases range from 5 in. to 10 in. square—heights from 6¾ in. to 11¼ in.

EFFORTLESS FOOT CONTROL—Balanced piston design—valve does not operate against line pressure.

FAST, POSITIVE ACTION—Valve ports and internal chambers are full pipe size; piston is light in weight. This assures rapid response and fast reversals without excessive vibration or wear.

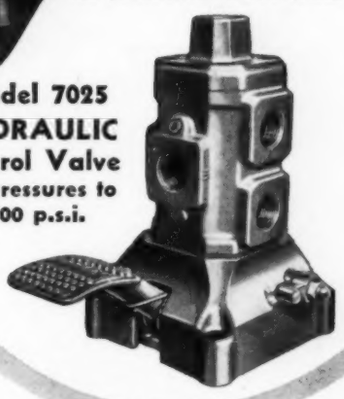
INFREQUENT MAINTENANCE—No valve seats to become worn. *Air valves* have long-life synthetic cup packings (no rod packing). *Hydraulic valves* have no packing except stem seals, subject only to exhaust pressure.

** Design Reg. U. S. Pat. Off.* *† Trade Mark Registered*



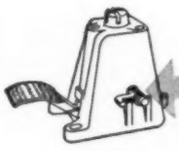
Model 6520 AIR Control Valve for pressures to 150 p.s.i.

Model 7025 HYDRAULIC Control Valve for pressures to 1500 p.s.i.



2 DISTINCT TYPES of CONTROL

LATCHING CONTROL (Indefinite Dwell)



With latch lever *turned forward*, valve piston is shifted and *latched* when pedal is pressed, starting the cylinder outstroke. Operator can then release pressure of his foot—line pressure continues to be directed to desired end of cylinder, providing *indefinite dwell* at end of movement. When pedal is pressed *a second time*, latch releases and valve piston returns by spring load to normal position, reversing cylinder movement and providing indefinite dwell until cycle is re-started.

INSTANT RELEASE (Spring Return)

With latch lever *turned back*, latching mechanism is thrown into neutral. Valve piston is shifted when pedal is depressed, and returns to normal position by spring load *as soon as foot pressure is released.* Thus pressing the pedal initiates the cylinder outstroke—releasing it will reverse cylinder movement.

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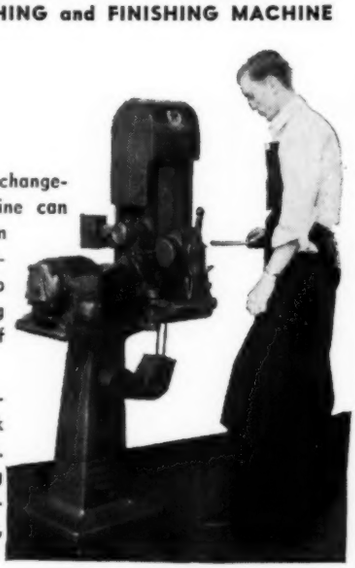

By a quick and simple change-over, the Type S machine can be converted for use from a centerless feed cylindrical polishing machine to a machine for handling straight line finishing of flat or irregular work.

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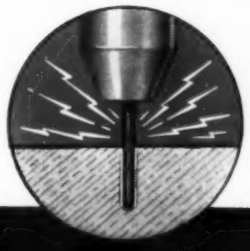

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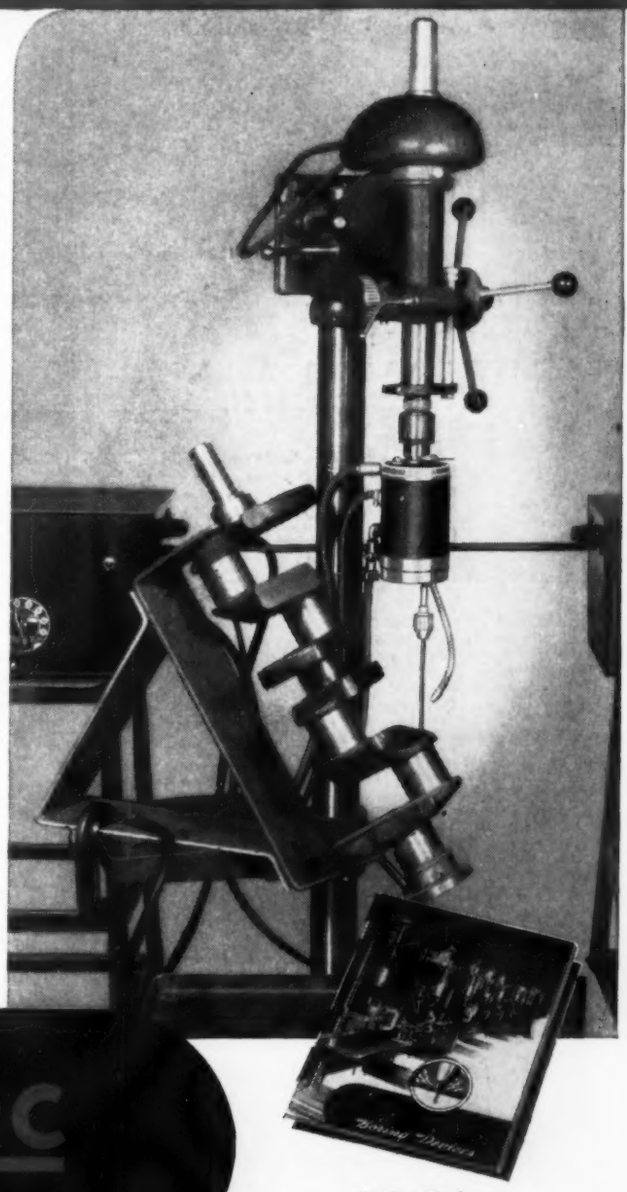

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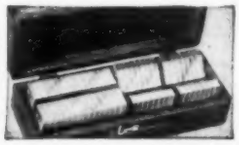

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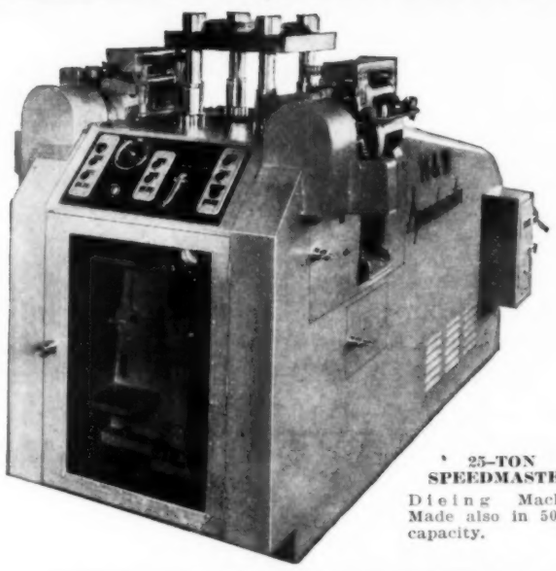

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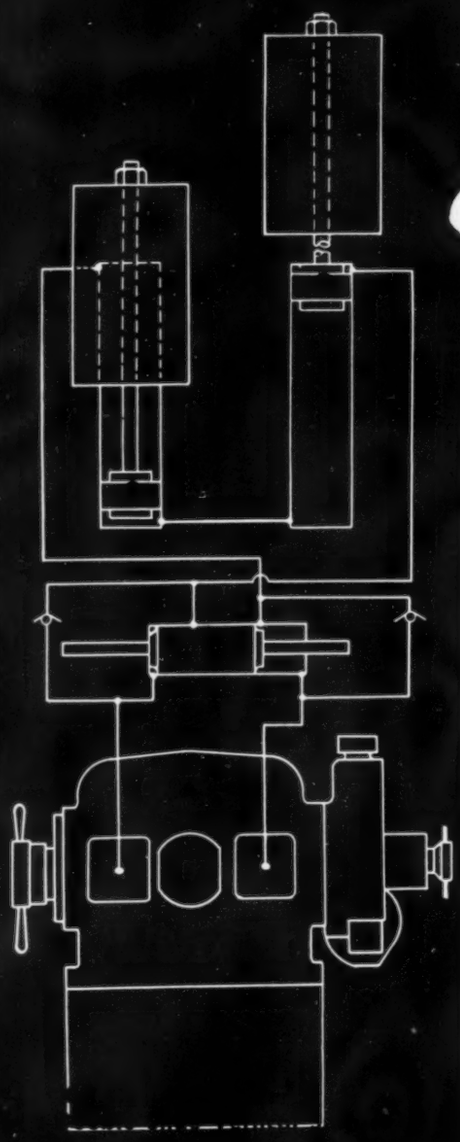
SPECIAL features are *Standard*



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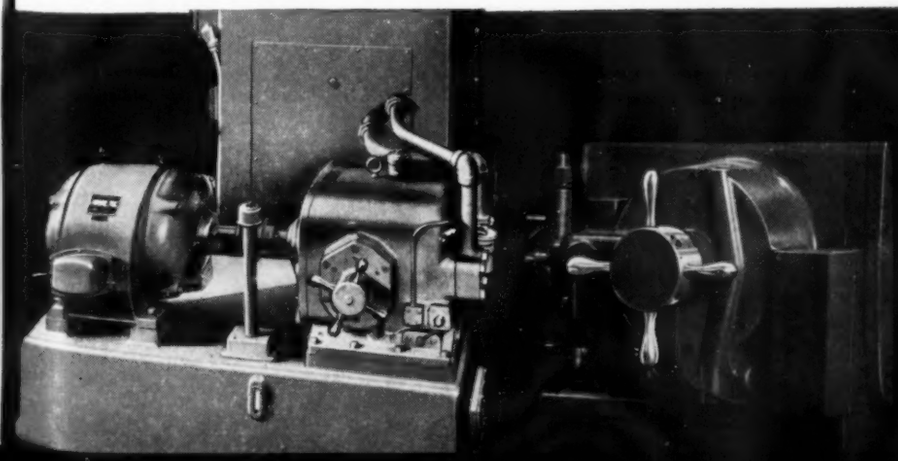

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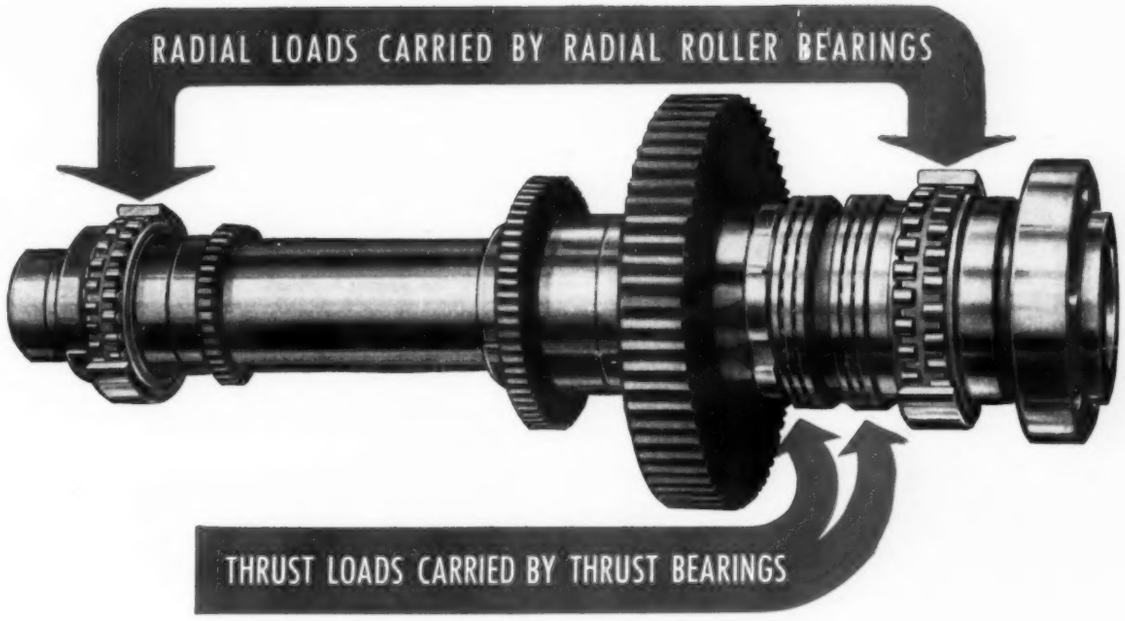

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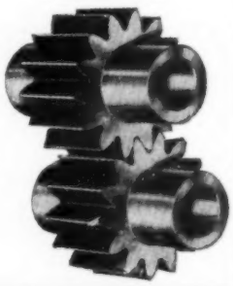

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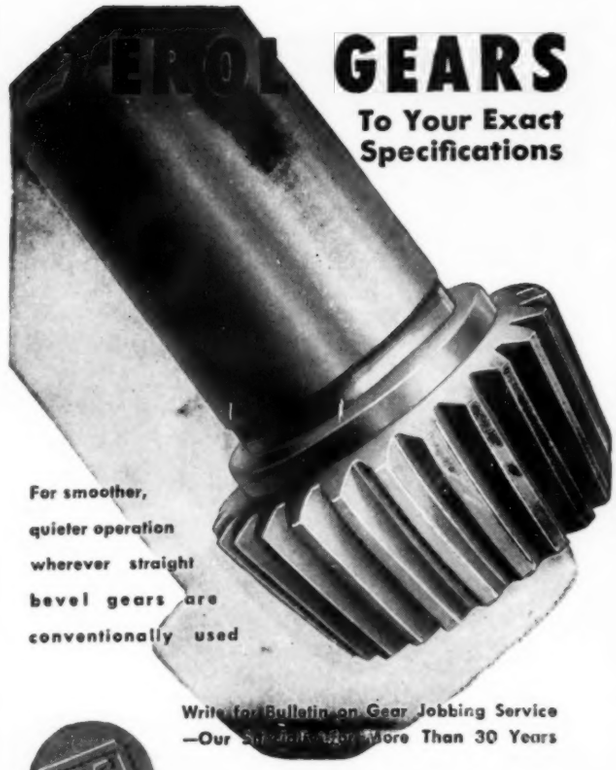

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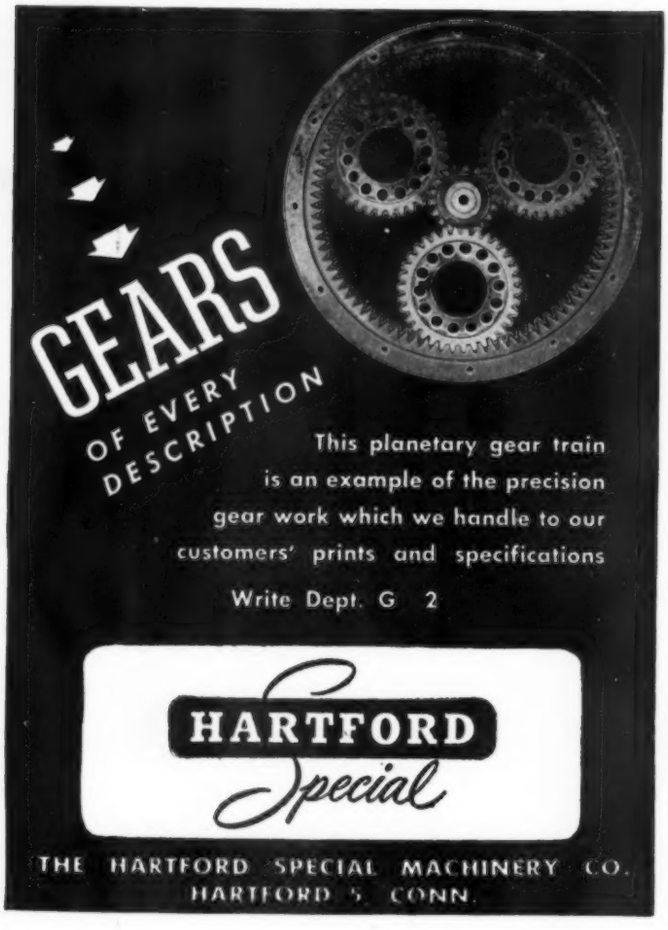

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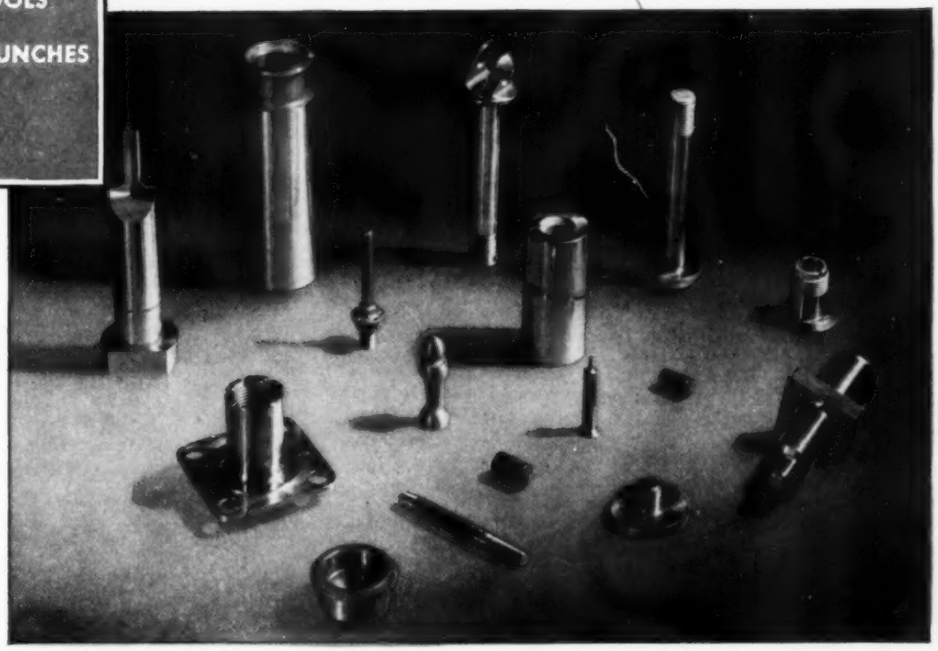

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YOUR SPECIFICATIONS for hardened and precision ground parts produced in high volume are met exactly at Allied Close tolerances . . . carefully controlled heat treatment . . . fine surface finishes . . . are always in strict accordance with your requirements. And whether your parts may be difficult or simple, Allied can produce them for you . . . economically and on time. Send us your part prints. We will submit quotations promptly.

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CORPORATION
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The Most Advanced Tool Maintenance Equipment Carries the NAME . . . . OLIVER

THE OLIVER ACE

The "ACE" Tool and Cutter Grinder has proven its worth in toolrooms around the world — GETS MORE PRODUCTION — Cutters stay sharp longer . . . less down time for changes . . . MORE ECONOMICAL—the average life of a cutter is longer . . . fewer replacements. MORE ACCURATE — Cutters sharpened on the "ACE" have all teeth uniformly ground and all teeth cutting.

Use the "ACE" to keep reamers, end mills, side mills, spot facers and all kinds of special tools and cutters in like new condition.

OLIVER OF ADRIAN PRODUCTS

SEND FOR CATALOGS

510 DRILL POINTER

Methods studies, taken on drilling operations, have proven that drills sharpened by machine will outlast and outperform drills sharpened by hand.

The OLIVER DRILL POINTER produces the only theoretically correct point for mass production drilling—All points are the same on all drills. Correct clearance and hollow ground centers assure that all drills are drilling equally at the same time.

Without cost to you—send us a few drills to sharpen—Test them on your jobs—you'll see a marked improvement in your Drilling equipment and tools.

IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION

OLIVER INSTRUMENT CO.
1414 E. Maumee St., Adrian, Mich.

OLIVER OF ADRIAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIAMOND MACHINES

FOR BETTER FORM-TOOLS

send your specs to J & S

Long experience in the production of accurate Form-Tools has enabled us to develop methods and equipment that reduce man-hours. We pass these savings along to our customers. For the high quality of workmanship, our prices are unusually attractive. *Send us your specs and see for yourself.*

- *Boring tools, circular form tools, carbide tipped form tools, counterbores, end cutters, flat drills, gun drills, hollow mills, recess tools, spiral form tools, step drills, taper reamers, watch tools, etc.*

J & S TOOL CO., INC.
479 Main Street, East Orange, N. J.
Representatives in Principal Cities

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

- Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

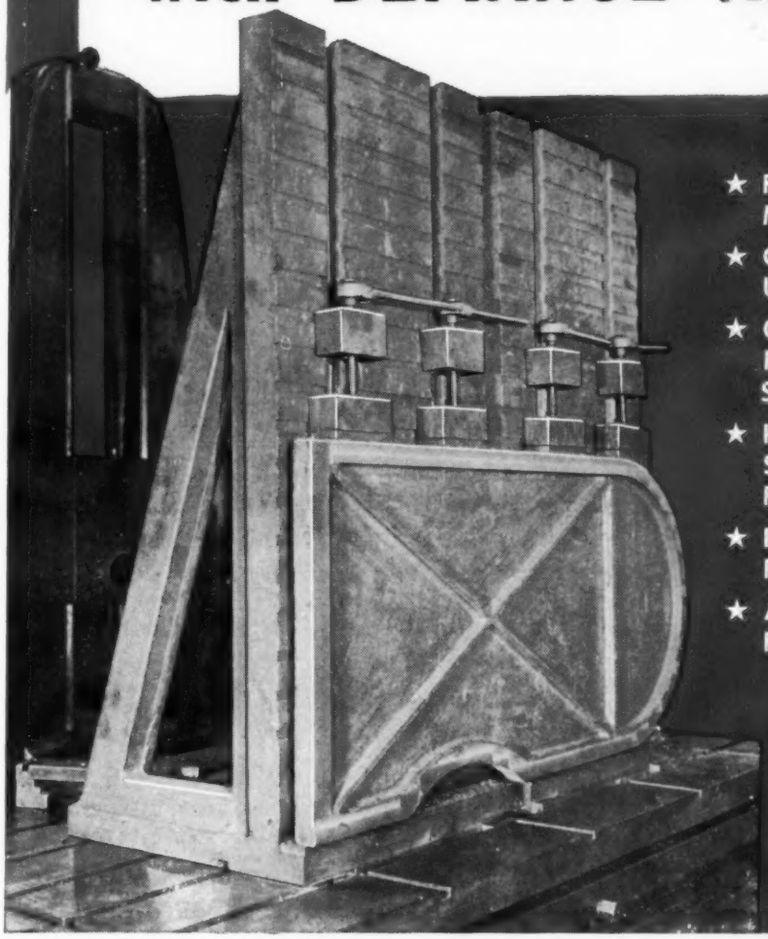
The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI 22, OHIO

Quick Set-Ups FOR MACHINING with DEFIANCE ANGLE VISES

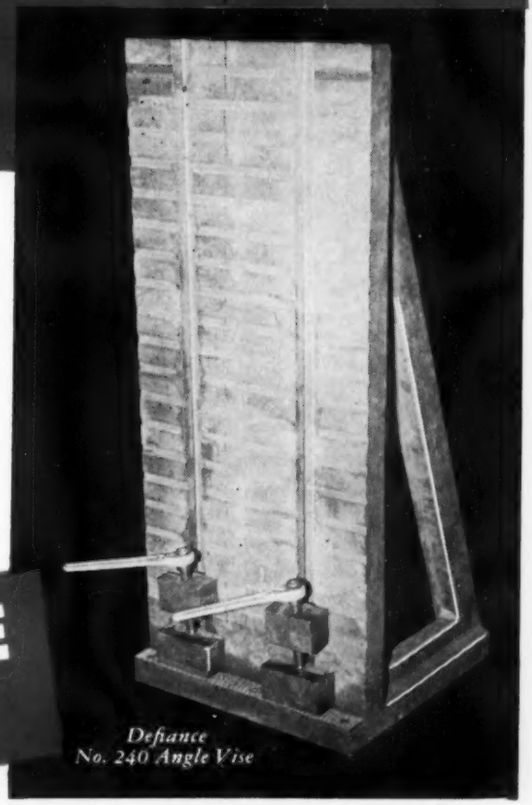


- ★ FOR VERTICAL CLAMPING IN ANY MACHINING OPERATION
- ★ QUICKLY ADJUSTABLE FOR WORK UP TO 39⅜"
- ★ CLAMPING JAWS EQUIPPED WITH REVERSIBLE RATCHET HANDLE FOR SPEEDY SET-UPS
- ★ HEAVY, RIBBED, CAST IRON CONSTRUCTION . . . HOLDS THE WORK FIRMLY
- ★ HARDENED STEEL CLAMPING SURFACES
- ★ ACCURATELY MACHINED FOR PRECISION RESULTS

Cast iron plate clamped rigidly with a pair of Defiance No. 240 Angle Vises for a milling operation.

You can *save set-up time* in any machining operation where vertical clamping is needed . . . with these quickly adjustable Defiance Angle Vises. Easy to use with any type of machines . . . boring, milling, drilling, and others. Available in two sizes, both with capacity for work up to 39⅜". No. 140 Angle Vise is 10" wide, with single jaws; No. 240 is 20" wide, with double jaws. Rugged . . . dependable.

More Defiance Accessories—designed to save time and labor and cut costs—include: Tools and Boring Bars, Auxiliary Tables, Vernier and Dial Attachments, Facing Heads, Indexing Tables, Power Fed Tables, Threading Attachment, Universal Milling Head. Write for bulletins. Defiance Machine Works, Inc., Defiance, Ohio.



Defiance No. 240 Angle Vise

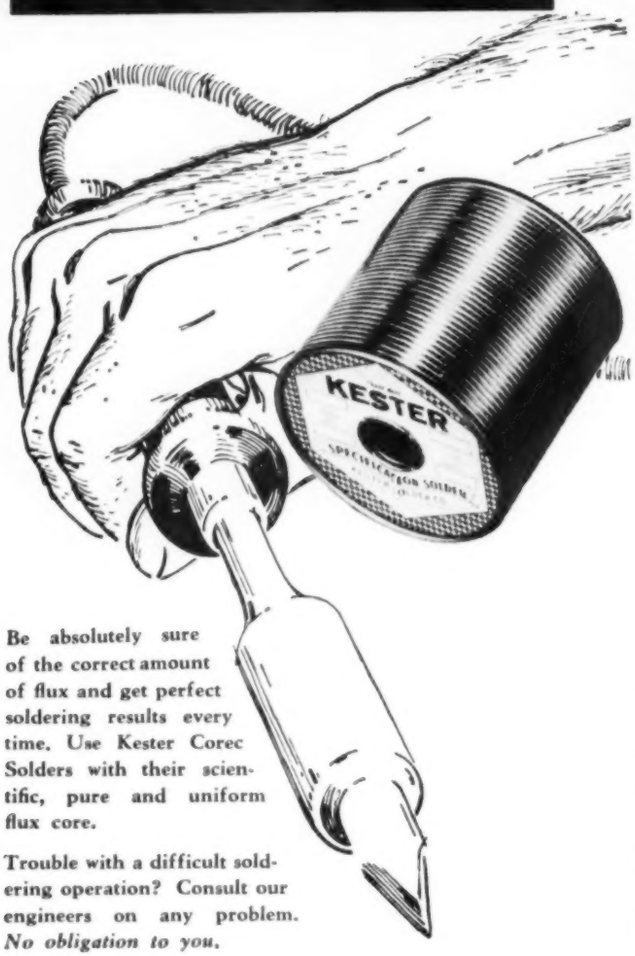
98 YEARS OF PRECISION MANUFACTURING

DEFIANCE

BORING . . . MILLING . . . DRILLING . . . TAPPING MACHINES

Standardize on Kester Cored Solders!

POSITIVE FLUX CONTROL

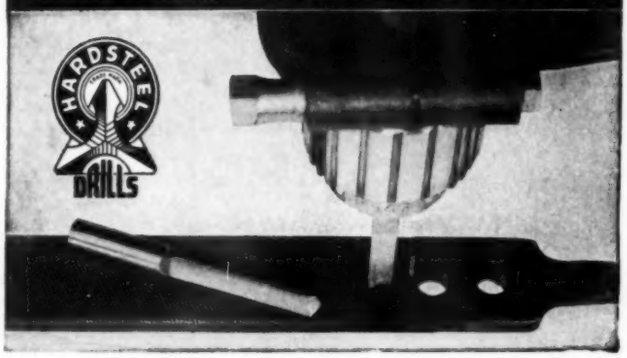


Be absolutely sure of the correct amount of flux and get perfect soldering results every time. Use Kester Corec Solders with their scientific, pure and uniform flux core.

Trouble with a difficult soldering operation? Consult our engineers on any problem. *No obligation to you.*

KESTER SOLDER COMPANY
4223 Wrightwood Avenue, Chicago 39, Illinois
Factories also at: Newark, N. J.—Brantford, Canada

Drill Hardened Steels *without Annealing* with "HARDSTEEL"



Don't let anyone tell you that hardened steels must be annealed before drilling, countersinking, counterboring or reaming.

With "HARDSTEEL" drills you can produce accurate, smooth holes in steels hardened by any process — oil-hardened, water hardened, cyanided, nitrided, and they work equally well on work-hardening steels, and high carbon-high chrome steels of any degree of hardness.

"HARDSTEEL" drills used with standard drill presses cut costs in production shops because parts drilled after hardening always match at assembly. In service shops they save time and material and permit engineering changes calling for additional drilling to be made after parts are full hardened.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are now functioning in thousands of plants in parts recovery operations.

You Harden It — We'll Drill It — with "HARDSTEEL"

"HARDSTEEL" Tool bits make faster, deeper cuts on steels and non-ferrous alloys.

BLACK DRILL CO.
Division Black Industries
1388 East 222nd Street
CLEVELAND 17, OHIO

"HARDSTEEL"
DRILLS • TOOL BITS • SPECIALS

to the uses for HANSEN COUPLINGS

NEEDED IN EVERY FLUID LINE

Economies are created in every plant by the use of HANSEN couplings in fluid lines. The quick-connective and shut-off features of these couplings save you time and money, and the variety of jobs they do is endless.

HANSEN couplings make connections and change-overs a matter of seconds. Costly operations are not interrupted . . . equipment continues to produce. Connection is made by pushing plug into socket . . . flow starts at once, automatically. Slight movement of the socket sleeve releases plug, and supply line is immediately sealed . . . one-way or two-way shut-off. For applications where no closure is desired, a "straight through" series has been designed. Each HANSEN coupling is engineered for the service for which it is recommended, and there is no limit to the uses for HANSEN couplings in these services.

Write for Industrial Catalog No. 47

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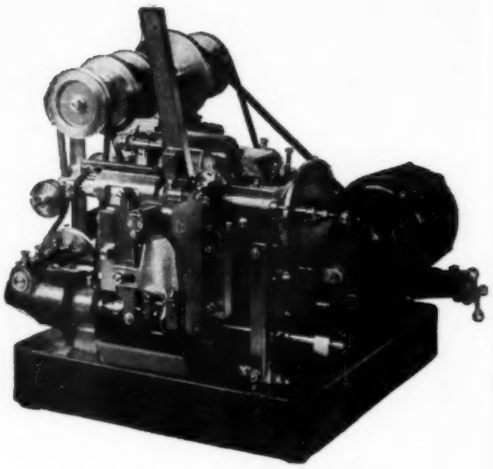
QUICK CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

WALTHAM PINION and GEAR CUTTING MACHINES



Fine Pitch Mechanisms—produced to tool room standards . . . . . .

These bench machines — built in Single Cut, Multiple Cut and Magazine Feed types — are designed primarily for low-cost, fast and close tolerance production of fine pitch parts for watches, instruments, gauges, meters, time fuses, etc. Their versatility makes it possible to handle a wide range of parts on Waltham Machines.

Operation is simple and fast. A revolving cutter makes successive cuts on blanks held and indexed by the work spindle. Precision parts can be made to close specifications without any special skill being required of the operator.

Special cutters can be made to customers' specifications.

OTHER WALTHAM PRODUCTS

Thread milling machines for small sized work. Cylindrical Sub-Presses for precision Dies.

Condensed Specifications

PINION MACHINES

Diameter Capacity — Approx. ½ in.
Coarsest Pitch — about 32 D.P.

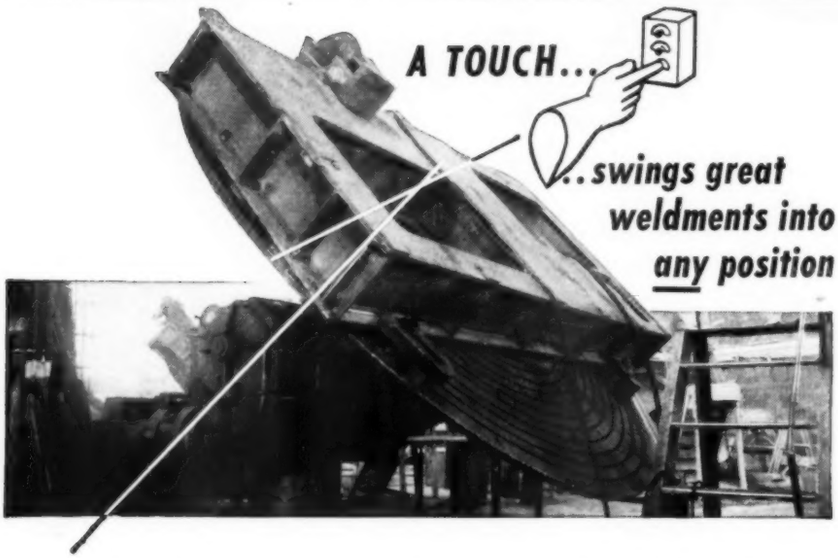
GEAR MACHINING

Pitch Diameter, Capacity 1½ in.

Illustrated literature and full details available promptly on request.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.



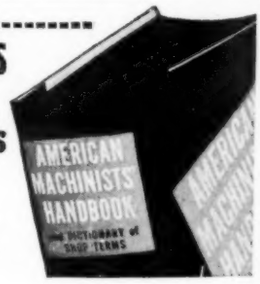
When welders can swing tons of weldment into any position for the next downhand pass quickly and safely with a touch on the push button control they are able to work better, faster and more economically, no matter what the job. Interruptions in any welding operation are costly—when welders or their helpers must prop up, flop, turn over, crawl under, over and around a weldment, they are adding costs to the job. Because more and more welding is being done in today's production, it is important that your welding costs and quality be examined in the light of economies and improvements made possible by C-F Positioners.

Not only do C-F Positioners give welders more time for welding by permitting them to swing weldments into the correct position for a downhand pass, they make all welding better and more economical by making possible the use of heavier electrodes, eliminate "overwelding" and waste of power and materials. Write for Bulletin WP 22. CULLEN-FRIESTEDT CO., 1313 S. Kilbourn Ave., Chicago 23, Illinois.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

ANSWERS *your* questions *on today's* MACHINE SHOP *standards and practices*



Here is the Eighth Edition of this standard technical handbook—a widely recognized source of dependable methods, definitions, and useful data for everyone connected with machine-shop work. Contains the **right** answers to any question—on layouts, feeds, tools, jigs, fixtures, speeds—anything in machining or drafting. Gives you the latest data on wire measurement for screw threads . . . 38 pages of new material on screw threads . . . recent data from leading makers of milling machines and cutters . . . 2500 illustrations show you step-by-step methods for every operation. 1537 pages, $6.00

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By Fred H. Colvin and Frank H. Stanley

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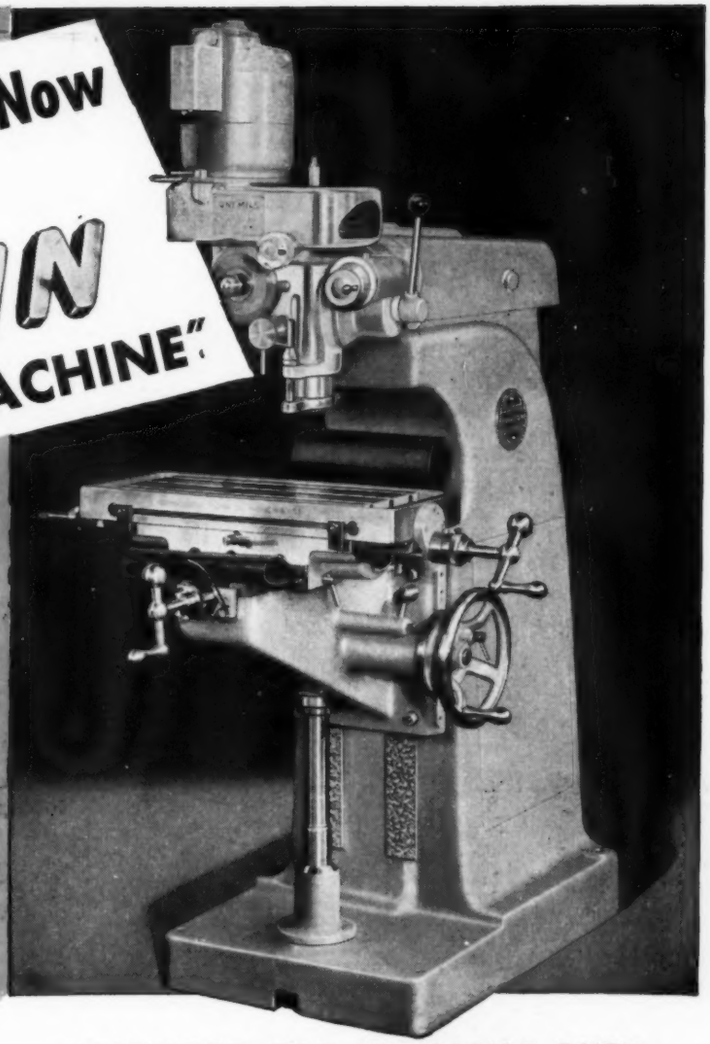
"Get Complete Details Now on the New GORTON ALL-PURPOSE MACHINE"



ANNOUNCING THE NEW 0-16A SUPER-SPEED MILLING MACHINE

(with Swivel or Universal Head)

Indispensable in the Tool Room and Machine Shop . . . Adaptable for General Engraving, Brass Routing, Die and Mold Duplicating

This new 0-16A *Gorton Super-Speed mill incorporates all of the features necessary in an "all purpose" machine. It will do a better job for you on any work within the limits of its size.

The Gorton 0-16A is *rugged.* It is designed for operator convenience and features extremely sensitive table and saddle controls. Spindle speeds from 300 to 10,000 R.P.M. available ½ H.P. motor.

*Trade Mark Reg. U. S. Pat. Office

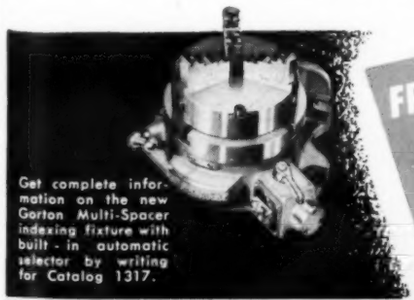
DESIGNED FOR VERSATILE DUTY-- Check These Features

Heavy column, adjustable ram, super-speed spindle permanently lubricated, swivel or universal head, positive spindle brake, spindle lock, quill lock, depth stop graduated in thousandths, micrometer and lever feed on spindle.

Adaptable for . . .

. . . General engraving and brass routing by using special extension spindle and foot treadle attachments.

. . . Die and mold duplicating by adding tracer head and duplicator table.



Get complete information on the new Gorton Multi-Spacer indexing fixture with built-in automatic selector by writing for Catalog 1317.

FREE all the facts FREE

On the new 0-16A *Gorton Super-Speed Swivel Head Universal Head Mill . . . use this coupon or write for Bulletin No. 1655-1504 No obligation, of course.

PLEASE SEND WITHOUT OBLIGATION
BULLETIN No. 1655-1504

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GEORGE GORTON MACHINE CO.

Tracer Controlled Milling

1504 RACINE STREET • RACINE, WISCONSIN, U. S. A.

YOU CAN SAVE MONEY TEN WAYS BY USING GARRISON GEAR CHUCKS

SEND FOR THIS FREE BOOKLET TODAY

Here is a booklet that will help you find where, why, and how much your costs are higher than necessary . . . on an over-all or plant basis . . . due to inadequate gear chucks. You will be amazed at the many ways you may be losing money throughout your plant due solely to inadequate gear chucks in the gear department. This information has never been published before. It is based on our experiences in hundreds of gear plants during the twenty-five years we have been supplying them precision, custom-built gear chucks. You can read it in fifteen minutes.

Whether you run a department or an entire plant, buy material or sell your firm's output, this booklet will be of great value to you. Write on your letterhead today for this informative booklet!

GARRISON MACHINE WORKS, INC.
DAYTON 4, OHIO, U. S. A.

Here's how to harness that "shortage" nightmare

To get supplies and equipment *fast* and lick your shortage problems, specify shipment by Air Express. It's the *fastest possible way* to ship and receive. There's no time wasted at airports, because Air Express goes on every flight of the Scheduled Airlines. And you get door-to-door service at no extra cost.

Rates are so low it pays you to use Air Express regularly. And Air Express is inexpensive for the heaviest weight shipments, too. Standardize on this speedy, low-cost business service.

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Specify Air Express—World's Fastest Shipping Service

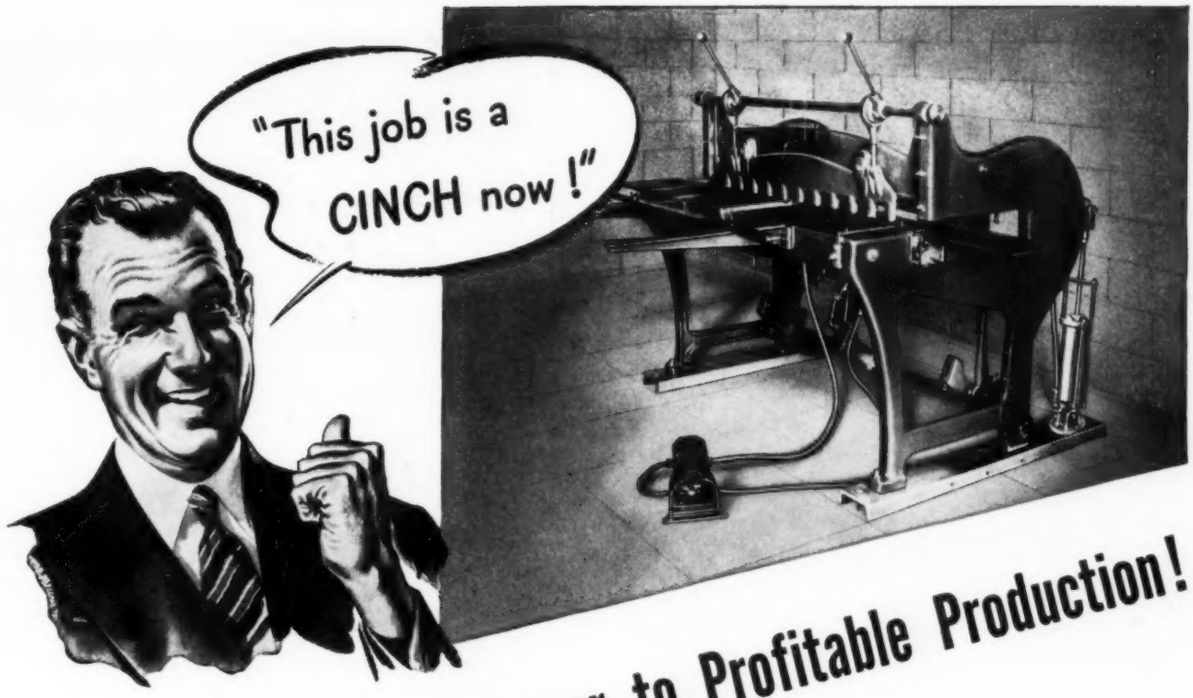
- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost.
- Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.

True case history: Trailer replacement parts are regularly Air Expressed from Kansas City factory. Keeps valuable equipment rolling. Typical shipment: 31-lb carton picked up 2 P.M. the 11th, delivered Los Angeles, Cal., the 12th, 7 A.M. 1360 miles, Air Express charge only $ 13.32. Any distance inexpensive, too. Phone your local Air Express Division, Railway Express Agency, for fast shipping action.

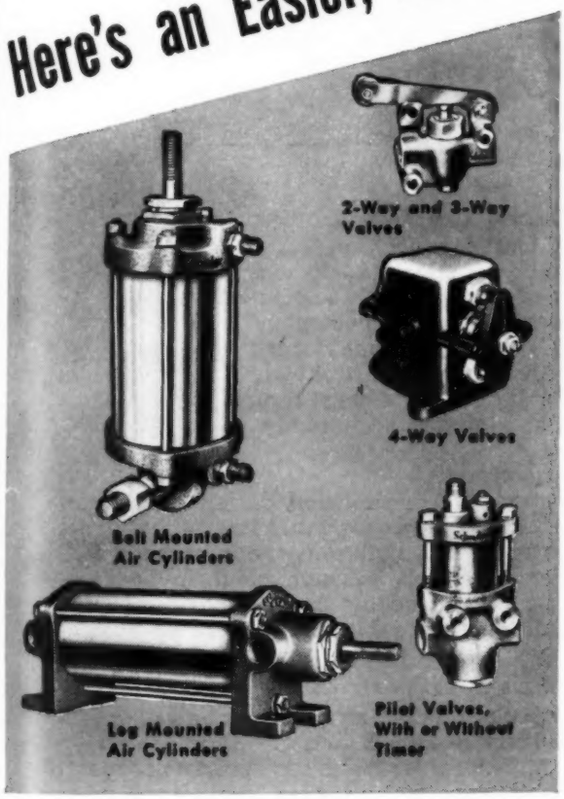
AIR EXPRESS
GETS THERE FIRST

Rates include pick-up and delivery door to door in all principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE
SCHEDULED AIRLINES OF THE U. S.



Here's an Easier, Quicker Answer to Profitable Production!


2-Way and 3-Way Valves
4-Way Valves
Foot Mounted Air Cylinders
Leg Mounted Air Cylinders
Pilot Valves, With or Without Timer

Can you improve production and safety of manufacturing operations quickly and easily without expensive alterations to plant or machinery?

Yes! By using compressed air, efficiently controlled by Schrader Valves and Air Cylinders, to operate your machines. Take this shearing machine for instance: by converting to air control, production is boosted, operator fatigue eliminated, and there is far greater ease and versatility of operation. Not only that but with air power you can frequently shear heavier gauge metal. This is a typical illustration of what Schrader Valves and Cylinders can do when put to work on shearing machines, power presses, welding machines, kick presses, arbor presses and many other essential machines.

Consider Schrader Valves and Cylinders as production boosters in your plant. Installation can often be made with little or no extra load in your present compressor capacity.

Schrader Air Cylinders and Valves give you efficient control of compressed air. Help you accomplish more—in less time—with less manpower used.

For further information on how these Schrader products can help you, write today to Department AM 4118.

EVERYTHING FOR EFFICIENT AIR CONTROL

Air Cylinders, Operating Valves 2, 3 and 4-way (hand, foot and remote control), Press Operating Controls, Pneumatic Machine Controls (all types), Air Ejection (Knockout) Sets, Quick Acting Couplers, Blow Guns, Air Hose and Fittings, Hydraulic Gauges.

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Division of Scovill Manufacturing Company, Incorporated

Schrader
PRODUCTS
CONTROL THE AIR

ROTO-MATICS

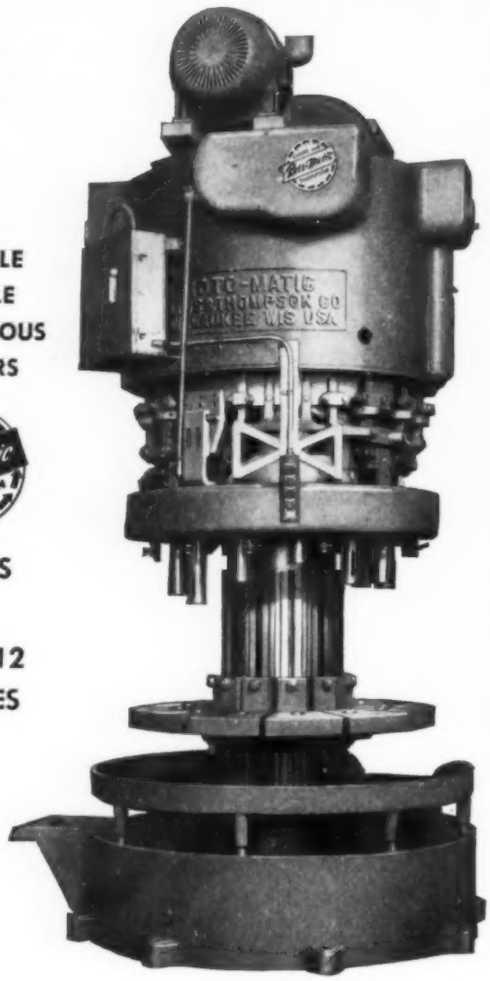
VERTICAL

MULTIPLE SPINDLE CONTINUOUS DRILLERS

DAVIS and THOMPSON Roto-Matic

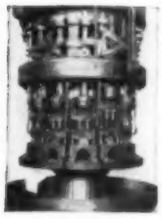
3 SIZES

6-8 OR 12 SPINDLES

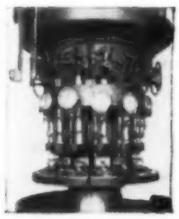


One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.



2 SPINDLE DRILL HEADS



BALANCING OPERATION

AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.
MANUFACTURERS OF *Machine Tools*
MILWAUKEE 14, WISCONSIN

Notice The Centerlines: In all Curtis joints the fork slots are centered accurately and pin holes align perfectly so pins will intersect at exact center.

Universal joints *must run true* to insure smooth, troublefree, vibrationless operation of rotating power transmissions with minimum eccentricity.

Important:
The axes of driving and driven shafts connected by universals *must* intersect at exact center of joint. Both pins of a joint *must also* intersect at this common point. In connecting non-intersecting shafts either two single joints or one double joint should be used.

Centerless grinding of a finished joint *does not* make the joint run true.

Special production machines and precision methods designed and used by Curtis in manufacture insure close precision operation of every joint, whether block or ball type.

Be sure of the best—Specify Curtis Universal Joints

Write Dept. B-3

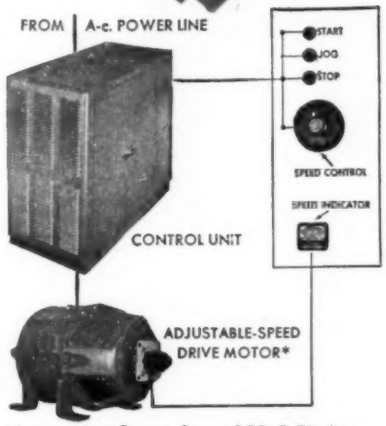
CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

Paving the way for TELEVISION . . .

RELIANCE V★S SYSTEM

provides Adjustable Speeds from A-c. Circuits

RELIANCE V★S DRIVE



Conveniently-packaged V★S Drives are available from 1 to 200 hp.

**Two or more motors may be operated simultaneously from a single Control Unit.*

Coaxial cables that will carry a television program requiring a frequency range of up to 6,000,000 cycles must be precision-made in every detail. So the Reliance V★S System is used for quick, accurate, wide-range speed control in rolling the copper tape outer conductor. The advantages of the V★S System in this and other applications in this new field are being demonstrated daily.

For further information on stepless speed changing—and facts about quick, smooth starting and stopping, maintenance of proper tension and other V★S functions that help improve production and cut costs, write today for the *new* Bulletin 311.

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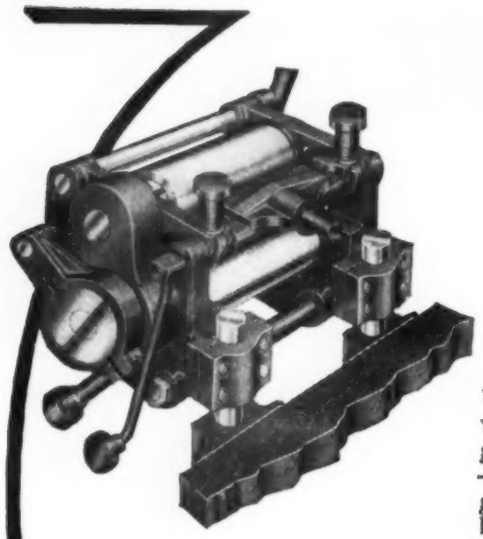
RELIANCE A-C D-C MOTORS

"Motor-Drive is More Than Power"

Announcing..

the NEW WHYTE

ROLL FEED



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Protect your valuable Jo-Blocks with a pair or two of these new super-hard Johansson Guard Blocks! Simply wring them onto the ends of any Jo-Block combination and they'll fend off virtually all the impact and abrasion of any gaging job.

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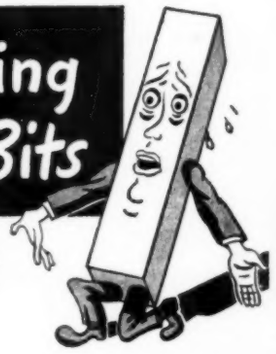
Stop Abusing Your Tool Bits



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Users say: The first real tool holder improvement in 25 years!
Exclusive vise-grip jaw eliminates rocking, because it exerts equalized pressure over *full* length of cutter channel, and not just at one point. Screw-operated jaw runs right to cutting edge and hugs bit so it can't slip, can't sag, can't break!

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One Clark Adjustable Tool Holder takes 4 or more sizes of square, undersize round or out-of-round, or narrow tool bits for cutting-off or special forming operations. Short bits and stub ends may now be used up.

For Carbide Tools and Boring Bars
In addition to Standard Clark Adjustable Tool Holder with 15° cutter channel, there's the Clark Parallel Tool Holder for better seating and better clamping action on carbide bits, threading tools, and boring bars.

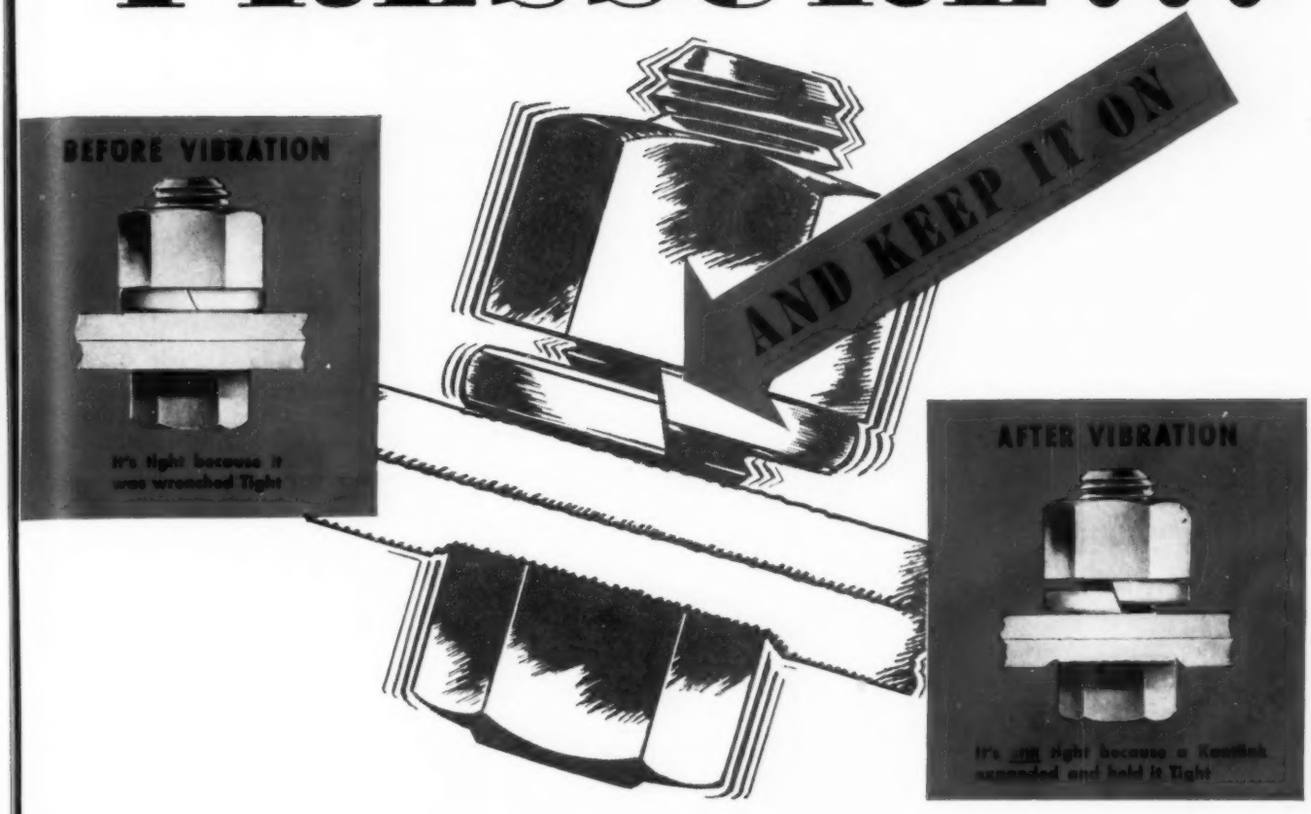
For complete information about Clark Adjustable Tool Holder, call your Clark Cutter Jobber today, or write for catalog **EE-2.**

SPECIFICATIONS		
MODEL	SIZE	TOOL CAPACITY
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

With 15° or parallel cutter channel either left or right hand.

CLARK CC CUTTERS
Robert H. Clark Company
9330 SANTA MONICA BLVD. • BEVERLY HILLS, CALIFORNIA

Put on the
PRESSURE...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It's tight because it was wrenched Tight
AND KEEP IT ON
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It's still tight because a Kantlink expanded and held it Tight

No nut can turn loose on its bolt so long as there is pressure on its threads.

Kantlink spring washers keep that pressure on. There is no substitute.

The first loosening or wear of bolted assemblies comes in the other parts, not from the nut turning on the bolt. Ductility may permit slight bolt stretch, or the gradual friction of metal on metal, or the grinding down of burrs, flares, or the pulverizing of scale, rust or paint—these things cause inevitable loosening unless a strong expanding spring washer keeps the pressure on.

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For continuous pressure on all your bolted assemblies specify Kantlinks—the wide range helical spring washers that are stronger, and hold all parts tight longer.

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Newark 5, New Jersey — Milwaukee 2, Wisconsin

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TWO MODELS: Model M-1 has 6" gap, develops 1270 lbs. ram pressure with 80 lbs. air. Model M-2 has 12¼" gap and 2650 lbs. capacity. Both moderately priced.

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NO TWIST
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- Drill up to ¼'' dia.
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(Uses Standard Attachments)

AMAZING! No Kick—No Twist—Even if you stall the spindle completely, the motor continues to run.

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AMAZING! It saves up to 90% of the time on nut-running operations alone.

AMAZING! With Standard Attachments you need only ONE INGERSOLL-RAND IMPACT TOOL to do all operations.

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SAFETY
CHUCK
WRENCH

Remains in chuck only when held there by operator

The 'Self-Ejecting' Amelotte Safety Chuck Wrench eliminates the possibilities of damage to machines and injuries to operators resulting from leaving conventional chuck wrenches in chucks. Made in sizes to fit any make or type chuck including geared drill chucks. Priced only slightly more than ordinary chuck wrenches, the AMELOTTE is an investment in accident prevention for every shop with an honest-to-goodness safety program.

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HARDNESS TESTER

The Scleroscope is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE
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are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

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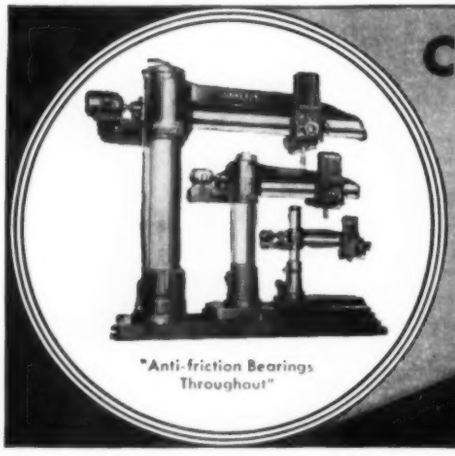

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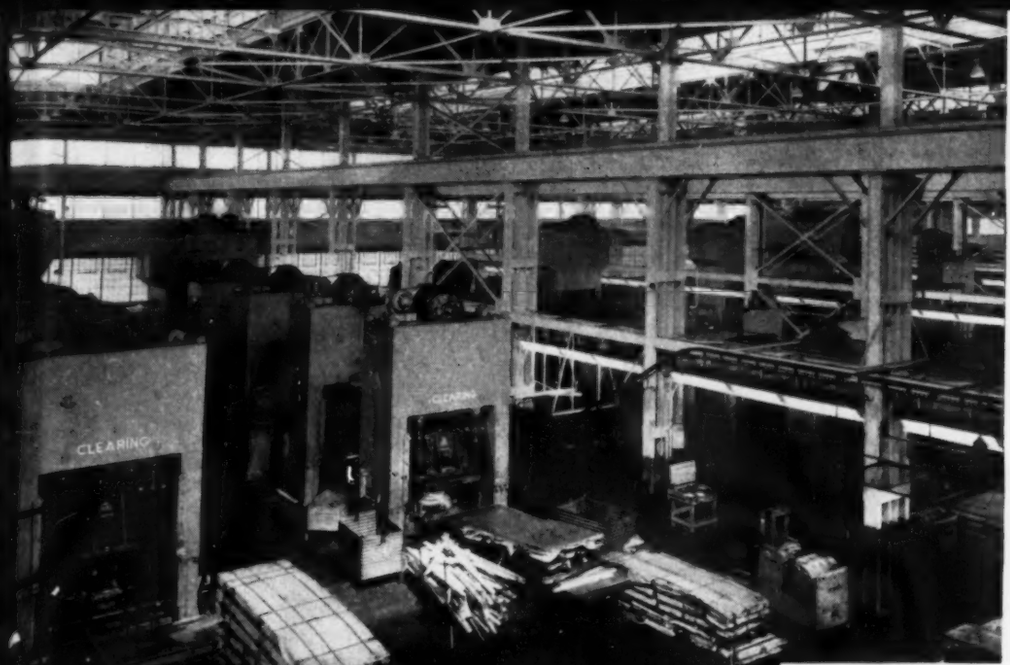
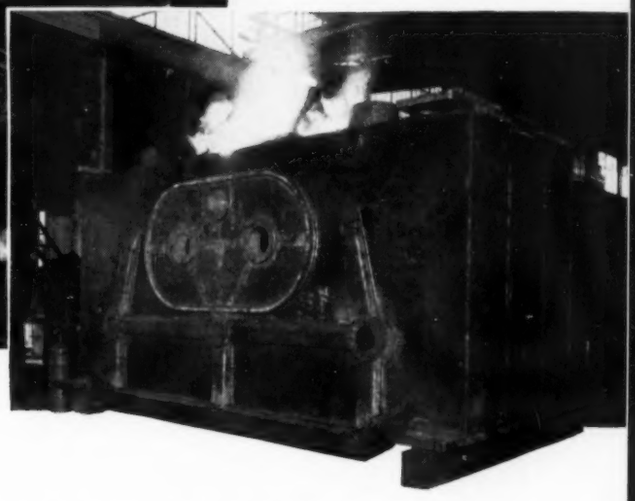
FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON
MACHINE TOOL COMPANY
CINCINNATI 25, OHIO, U. S. A.





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INSET: Clearing presses are built of rolled steel plate welded into one unit insuring minimum deflection at maximum rigidity. This type of construction permits the flexibility of design for which Clearing is well known.

WHY STOP SHORT OF MAXIMUM ECONOMY?

Production men agree that press methods are faster and far less costly than other means of giving shape to metal—but why stop there? Careful choice and application of the press itself can usually produce still further cost reductions.

A most important factor in press operation costs is the life of the dies. Frame rigidity and proper guiding of the slide make dies last longer and require fewer regrinds. That's why Clearing has always emphasized these features in its design. Clearing *pioneered* the welded, all-steel frame because such frames are inherently more rigid.

Save money by pressing rather than casting—yes. But secure *maximum* saving by doing the press job on a Clearing. Ask us to show you how and why. It costs you nothing to ask for facts.

CLEARING MACHINE CORPORATION • 6499 W. 65th St., Chicago 38, Ill.

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CMC
CLEARING

CRATEX Soft Rubberized Abrasives

out-perform all others for light grinding, deburring, finishing and polishing

"CRATEX" is the registered trade name of a time-tested line of soft rubberized abrasives—Wheels, Points, Blocks, Sticks and other tools—If you want the BEST specify "CRATEX".

The cutting and polishing action of CRATEX wheels is soft and cushion like, yet strength and wearability are way above normal. Uniformity is maintained in their manufacture resulting in consistent performance. CRATEX wheels do not load or become clogged, requiring little or no dressing, and they can be operated safely at normal grinding wheel speeds (3000-5000-SFM).

Four standard grits—Coarse (C), Medium (M), Fine (F), Extra Fine (XF)

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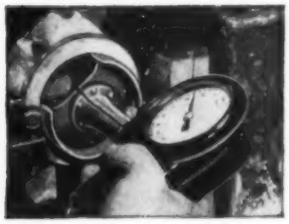
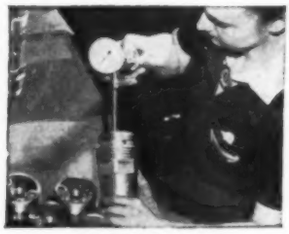
"In gaging precision holes, from machine to inspection, we find Comtorplug best combines accuracy with ruggedness."



MACHINE OPERATOR



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Patented Expanding Internal Comparator

with interchangeable expansion plugs for holes from ⅛" to 8" dia.

With the same interchangeable amplifier fitting expansion plugs from ⅛" to 8" dia., Comtorplug provides a gage of "Shop ruggedness with laboratory accuracy". Automatic features of self-centering and self-alignment assure positive accuracy in gaging bores to readings within a fraction of .0001". Not a passing reading. Actual size of hole is shown on dial. Automatic 2-point contact. Shows actual diameter, and detects front or back taper, out-of-round, bell mouth, barrel shape, etc. Gages the work while still in the chuck. Different operators always get the same reading. If you produce precision holes in quantity, by all means investigate Comtorplug.

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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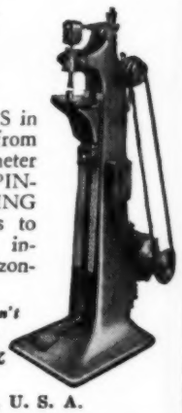
RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



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There's precious steel scrap, needed for increased steel production, lying in the backyards of hundreds of steel fabricators and steel users . . . perhaps even in your own! Scrap is needed in greater amount now than ever during the war. Won't you instruct your staff to clean house now in your plant and GET OUT THE SCRAP?

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Controlled CARBON and ALLOY

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SELECT THE RIGHT WHEEL

AND SAVINGS WILL FOLLOW

Vitrified makes it possible to standardize on grinding wheels by offering a wide range of standard types which cover practically all wheels used on standard makes of grinding machines.

Selection of the right wheel for the work to be handled is simplified in the Vitrified catalog—a 65-page booklet which gives specific data, dimensions, etc., covering the entire Vitrified line.

Send for this catalog. Choose a grinding operation in your shop on which you would like to cut costs. Select the Vitrified wheel which meets your specifications, try it out, and compare results with the method formerly used—and you, too, will join the long list of progressive manufacturers who have standardized on Vitrified.

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VITRIFIED WHEEL COMPANY
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HOW *Can You Test the Hardness of*

- . . . a .003″ diameter wire?
- . . . parts weighing hundreds of pounds?
- . . . sheets only .001″ thick?
- . . . internal surfaces of cylinders?
- . . . individual constituents of alloys?
- . . . gear teeth on the pitch line?

THESE are simple, every-day jobs for Wilson hardness testing equipment. Any of our representatives can give you the answer to these and many other such questions.

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Bring on your Tube Cutoff Problems!

ETNA

Tube Cutoff Machine

THE TUBE REMAINS STATIONARY . . .

IT'S THE CUTTER HEAD THAT ROTATES

The entire cutoff cycle—clamping of tube, cutting off and unclamping is completely automatic.

SINGLE PUSHBUTTON CONTROLLED

What are you doing about tube cutting?

THE ETNA MACHINE CO.

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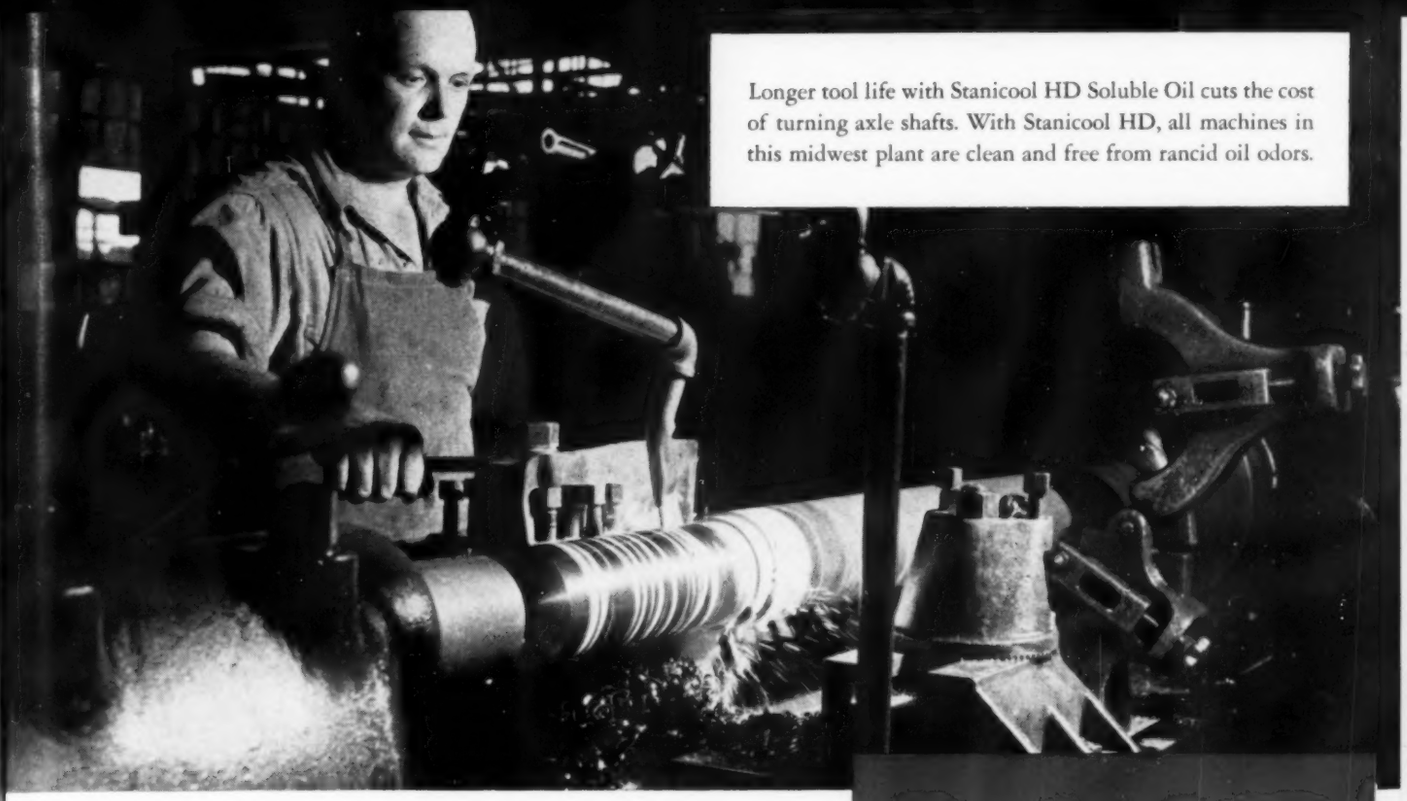


Longer tool life with Stanicool HD Soluble Oil cuts the cost of turning axle shafts. With Stanicool HD, all machines in this midwest plant are clean and free from rancid oil odors.

ow one cutting fluid replaced two ..solved knotty problem...

Stanicool HD Soluble Oil

• A troublesome cutting oil problem bothered a midwest metalworking plant. Soluble oil was supplied from a central tank to machines doing a wide variety of turning and boring jobs. However, a few operations, such as tapping and reaming, performed on these machines required a black cutting oil which was swabbed on the tool. When the black oil became mixed with the soluble oil it dirtied the machines. It also was carried to the central tank, where it covered the surface of the coolant and caused rancidity.

On a Standard Oil Engineer's recommendation, both oils were replaced with Stanicool HD Soluble Oil. The central tank was filled with Stanicool HD, and a concentrated mixture of four parts Stanicool HD to one part water was used on taps and reamers in place of the black cutting oil.

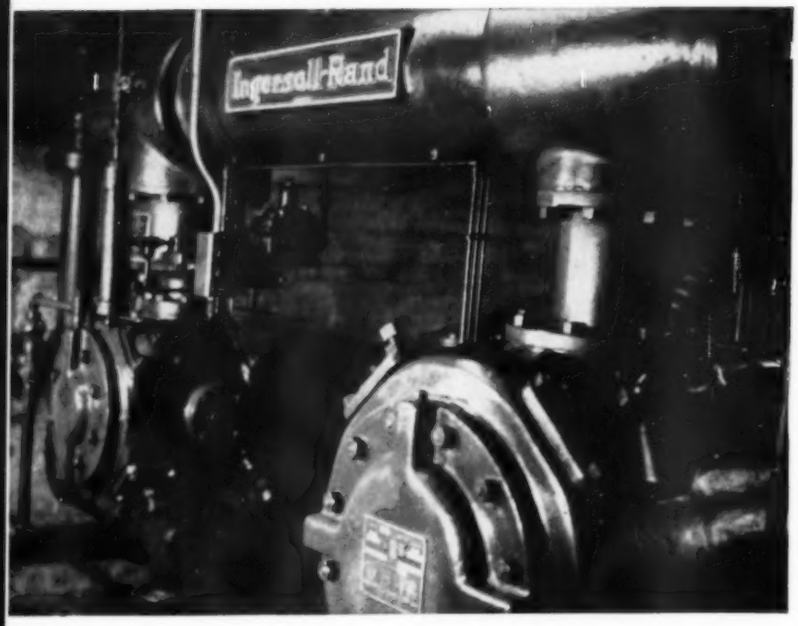
Stanicool HD proved superior both as a coolant and as a cutting oil. It gave clean operation, eliminated oil rancidity and odor, and reduced by 50% the time and cost of cleaning the central tank. It increased tool life on all machining operations and saved stocking a special cutting oil for taps and reamers.

Ask a Standard Cutting Oil Specialist to show you how this dual-purpose coolant can improve tool life, increase production, and reduce the number of cutting oils in your plant. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Stanicool HD eliminated the additional use of a black cutting oil on this boring machine. Life of taps and reamers was markedly increased.

TANDARD OIL COMPANY (INDIANA) STANDARD

Compressor Problems Solved with . . . . . STANOIL



Ends gum troubles . . .

When a midwest toy manufacturer installed a new Ingersoll-Rand compressor, troubles arising from gum deposits prompted him to shift from a conventional lubricant to Stanoil, a highly stable, multi-purpose oil with an oxidation inhibitor.

Gum troubles stopped. Now, after 2½ years service with Stanoil, air cylinders and valves are free of deposits—"amazingly clean," according to the operating engineer.

5 years—no shutdowns for cleaning . . .

Until 5 years ago, excessive deposits on compressor discharge valves caused trouble no end for a midwest lumber company. A new intake filter failed to stop deposit formation. Although nearly convinced that downtime for cleaning could not be avoided, the operator was persuaded to try Stanoil.

Since that time, the compressor has never needed to be shut down for cleaning. The heat-resistant qualities and low carbon-forming tendency of Stanoil keep valves free from troublesome deposits.

11 years—with low maintenance . . .

In the past, valve deposits had to be cleaned frequently from a Chicago Pneumatic Air Compressor using conventional oil in a midwest pump-manufacturing plant. In addition to increasing maintenance cost, these deposits reduced compressor efficiency. At the suggestion of a Standard Oil Engineer, Stanoil was tried.

Result: eleven years of trouble-free operation, no carbon deposits, no bearing trouble. Stanoil has established an enviable record for low maintenance in this compressor.

You can get help on compressor-maintenance problems . . .

A Standard Oil Lubrication Engineer will be glad to help you test Stanoil in your compressors. He also can point out other equipment in your plant where the high stability and clean operation of this multi-purpose oil can save money and maintenance time. Write Standard Oil Company (Ind.), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

COVEL NO. 22 UNIVERSAL CUTTER and TOOL GRINDER

The purchase of a cutter and tool grinder involves several considerations —chief of which is—that it must grind quickly and accurately over a long period of time. The COVEL No. 22 has these qualities. It's rugged, accurate and dependable. It's easy to set-up, simple to operate and is readily adaptable for fast grinding on a wide variety of jobs. Especially suited to cylindrical and internal grinding because of its power feed and wet grinding attachments.

Write for name of dealer nearest you and request your copy of Bulletin A-78.

Some of the No. 22 Features Are:

- Hardened and ground, anti-friction ball-bearing table and saddle ways.
- Hardened and ground feed screws.
- Spindle lock for ease in changing grinding wheels.
- Patented attachment permits rapid hand movement of saddle through disengagement of cross feed screw.
- Well ribbed box type construction.
- Wide variety of special attachments for every type of grinding job.

CAPACITY

Swings work 10⅜" dia. by 30" long	
Longitudinal Table Travel	24"
Cross Travel of Saddle	8"
Vertical Travel of Spindle	7½"
Net Weight	2900 lbs.

Write for name of dealer nearest you and request your copy of Bulletin A-88

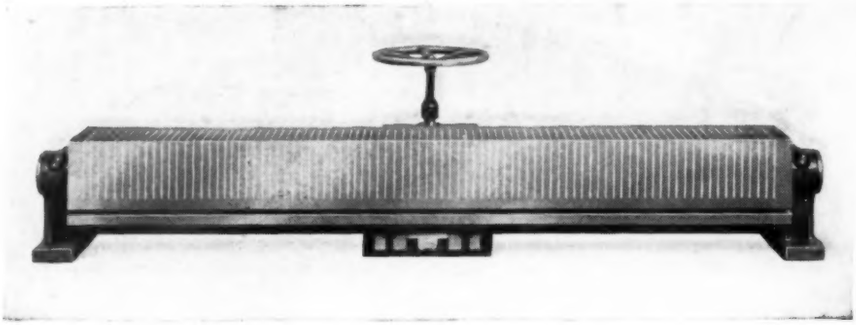
COVEL MANUFACTURING COMPANY

BENTON HARBOR . . . MICHIGAN . . . U.S.A.

Hold Everything! with Walker Chucks

"Walker does it again" has come to be well-known in the field of magnetic chucks.
A recent development which proves the versatility of Walker production—WALKER APEX SWIVEL CHUCK, 10"x10"x90"—or other sizes—gives magnetic uniformity over the APEX . . . fine pole division . . . absolute balance. This chuck is positively abuse-proof and water-proof. It is an outstanding advance in the magnetic principle applied to what heretofore was thought impossible.

Walker gives you the widest experience, progressive engineering and precise workmanship.



Walker Chucks **O. S. WALKER CO. Inc.** *Walker Chucks*

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

MEMO
to users of metal working equipment . . .

The new features recently installed on all Ruthman Gusher Coolant Pumps increase efficiency, prolong life expectancy, and reduce maintenance cost.

RUTHMAN GUSHER
COOLANT PUMPS

Illustrated is an Oilgear Type XP Vertical Broaching Machine equipped with a ½ HP Model TL-7320 Gusher Coolant Pump.

New type end-bell on totally enclosed motor has built-in conduit box with ample capacity to accommodate the multiple lead wires of dual voltage stators. Concealed through-bolts fastened from inside of upper end-bell give drip-proof construction and improved appearance. Oversized pre-lubricated ball bearings eliminate oilers or grease fittings.

Write now for Catalog 10-A

THE RUTHMAN MACHINERY CO.
1818 READING ROAD CINCINNATI 2, OHIO

"The Outstanding Basic Improvement in FLEXIBLE SHAFT Machinery in 25 Years"

GSY-5

The NEW Strand Rotoflex 4-speed gear drive Flexible Shaft Machine (shown upper right) is another step forward in Strand quality precision tools for faster, easier, more economical production work. The Rotoflex 4-speed gear drive employs a patented, new type of quick change gear drive utilizing 4 positive speeds by a unique and easy method of instantly changing from one speed to another. Rotoflex machines are powered with totally enclosed ball-bearing motors having speeds from 850 to 9000 R.P.M., depending on motor.

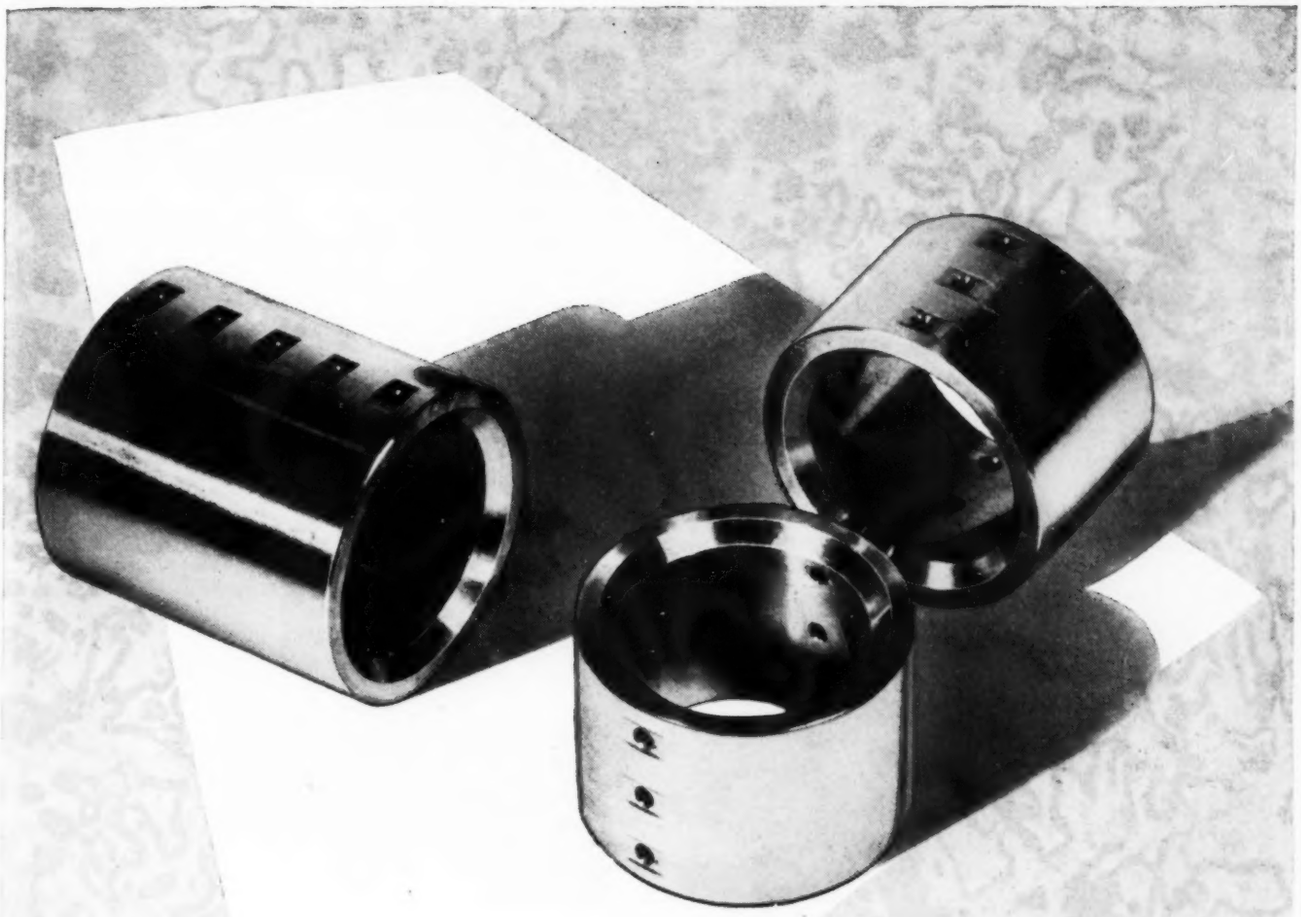
Standard type Strand machines, (lower right) give portable rotary power at constant speeds with dependable results in all grinding, buffing, drilling, wire brushing and rotary filing operations. Hundreds of types and models from ⅛ to 3 H.P. available with suitable attachments for your specific requirements.

Distributors in all principal cities
Ask for Bulletin No. 43 and Catalog No. 30

M-5

Strand FLEXIBLE SHAFTS

N. A. STRAND & CO.
5009 NO. WOLCOTT AVE.
CHICAGO 40, ILL.



During the war 70% of Bunting output was Precision Bearings, mostly for aircraft engines. These facilities are producing, today, the exceptionally fine bearings needed for the precision jobs of Post-War Industry. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

Bunting

BRONZE BEARINGS ★ BUSHINGS ★ PRECISION BRONZE BARS

72

OIL-FILLED BENCH STONES...

...DELIVER *EXTRA SHARPENING SERVICE* at the PRICE OF DRY STONES

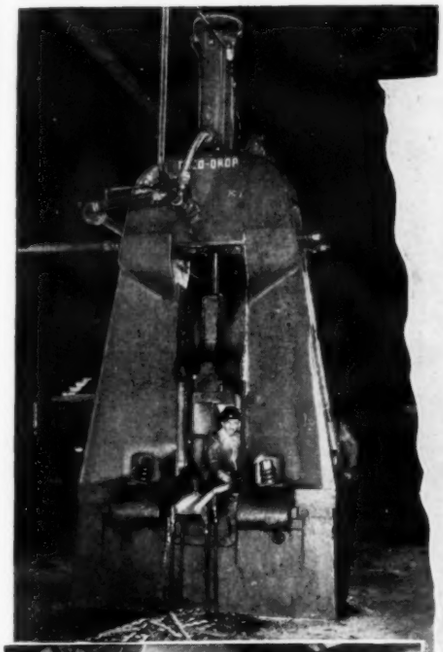
Oil filling is a built-in extra service feature of Crystolon Bench Stones — at the price of regular dry stones. And this is important, because bench stones are supposed to be used with oil. Oil makes them cut faster and cooler and produces a better cutting edge. Oil also helps them resist glazing or filling.

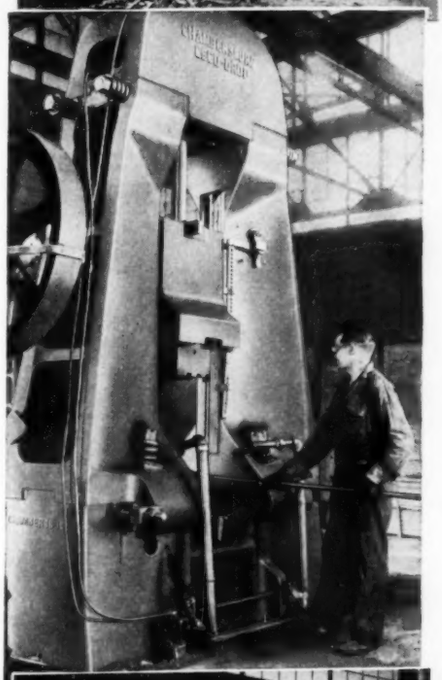
But oil filling is a messy job at best — and it has to be done right. The oil must penetrate the pores of the entire stone. And, unless the right kind of oil is used, the surface of the stone will gum.

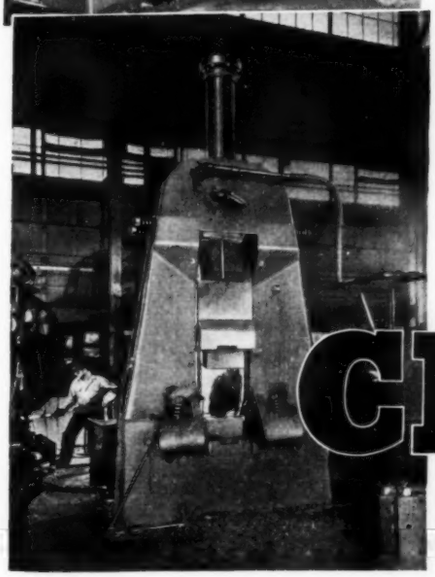
Crystolon Bench Stones are made of genuine Norton silicon carbide abrasive, vitrified bonded and oil-filled at the factory for your convenience and for better sharpening. Ask your Distributor to furnish oil-filled Crystolon* Bench Stones for extra service at no extra cost.

** For oil-filled aluminum oxide bench stones, specify "India."*

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.







Orders and re-orders prove it!

The statement that the Ceco-Drop makes other gravity drop hammers obsolete may have seemed over-enthusiastic a year ago when this new hammer was introduced. But the experience of forge shops which have installed Ceco-Drops—and ordered more—is the best evidence that the statement is simple truth. As the facts are known, the list keeps growing.

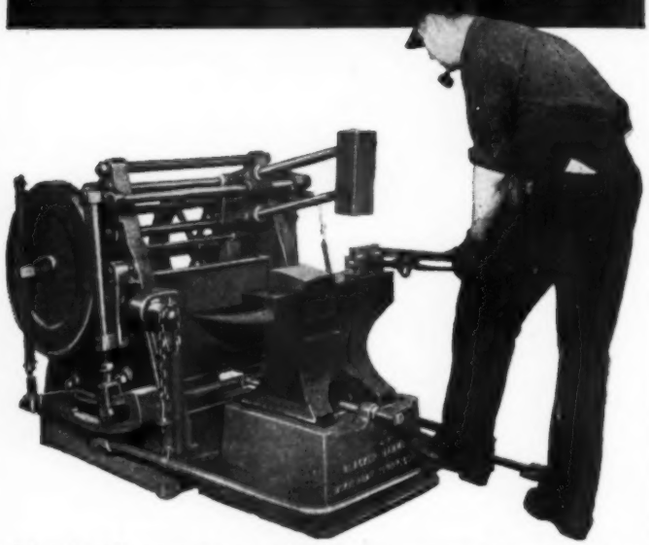
Write for these facts

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

CECO-DROP

CHAMBERSBURG
Builders of IMPACT Machinery

FOR BETTER SLEDGE WORK AT LESS COST



The McKiernan-Terry Blacker Hammer delivers sledge-hammer blows *exactly* as the smith wants them. Light or heavy blows, fast or slow, on any part of the anvil. And all under the smith's complete control.

No wonder that with a McKiernan-Terry Blacker Hammer the smith, alone, can accomplish more and better work than he can with human helpers. More operations per heat, more precision, more satisfaction—and no confusion around the anvil.

FIND OUT HOW

Send for Blacker Hammer Bulletin No. 56 and learn how this direct-geared, electric-motor-driven power hammer and anvil unit does the work of human helpers around the anvil. Learn how it saves time, reduces costs, increases anvil capacity and shop output. Get specifications, diagrams, etc. Free—just send the coupon.

McKiernan-Terry

BLACKER HAMMER

SIGN AND MAIL THIS NOW

McKIERNAN-TERRY CORP.
Manufacturing Engineers
18 Park Row, New York 7, N. Y.

Please send me a Blacker Hammer Bulletin #56

Name .....

Address .....

.....

As Dependable as "Old Faithful.." VALVAIR Solenoid Valves

Diagram shows double-acting air cylinder operated by Valvair 4-way solenoid valve, spring return.

DEPENDABILITY — That's outstanding in Valvair performance. Solenoids are Stellite-welded to resist wear; do not mushroom. Standard Valvairs have operated over 2,000,000 times at 100 lbs. with never a leak. *Exclusive features.* Patented basic design eliminates metal seats; non-corrosive (cast bronze body, stainless steel parts); full pipe area used with minimum drop. 2-way, 3-way, 4-way types. Get full details and prices.

Ask for Bulletin "A-N"

VALVAIR CORPORATION • 454 Morgan Avenue, Akron 11, Ohio

Valvair 4-WAY

FREE TRIAL OFFER
NO STRINGS ATTACHED

A VALUABLE KIT
Carton contains 6 grades of ultra-fine quality, assorted fine grit abrasive compounds suitable for a variety of work. Coarser grit compound can also be supplied.

6 LIBERAL JARS DIFFERENT GRADES

FOR PRECISION LAPPING

Here's a get-acquainted offer you cannot afford to miss. Among these samples will be found the answer to many a tool room lapping problem. Hard and soft abrasives for all kinds of lapping needs. Sent post paid anywhere in the U.S.A. and Canada. No obligation—write today.

OFFER LIMITED *Write today*

PROVE THEM AT OUR EXPENSE!

UNITED STATES PRODUCTS CO.
524 MELWOOD ST. USP **PITTSBURGH, PA.**

Chase can supply you
...WITH BRASS, COPPER, BRONZE PRODUCTS FROM STOCK!
WANT prompt delivery of brass and copper sheet, rod, wire, or tube? Or brass and bronze nuts and bolts, copper rivets and burs—a myriad of miscellaneous items? Try your local Chase warehouse.
There are 22 warehouses ready to serve you. Ready to fill your orders immediately, ready to place *big* orders directly with the mill for *prompt delivery!*
It's the easy way to obtain mill products—or almost anything in brass, copper, bronze.

Chase

the Nation's Headquarters for
BRASS & COPPER

WATERBURY 91, CONNECTICUT

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WATERBURY *(†Indicates Sales Office Only)*

AMES

FOR GREATER PRODUCTIVITY

You'll find this AMES No. 1 DIAL COMPARATOR a great aid in meeting your increased production schedules. It's *accurate*, first,—but *ease*, *impersonality*, and *speed* in measuring are also very evident. And they'll all be evident for thousands of readings—contributing low-cost maintenance to low initial cost—giving you highest quality measuring with the greatest possible economy—in dollars, time and human effort.

Ames indicators in any size or dial graduation may be attached. The No. 211 shown is graduated in .0001", has dial reading 0-5-0, and a range of .025".

Specifications

Capacity under contact:	2"	Height, overall:	9½"
Table diameter:	2"	Throat, contact to column:	1½"

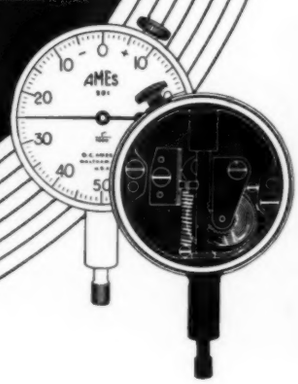
Weight: 4 lbs.

For information on our full line of Comparators and many other measuring instruments, address our Home Office:
26 Ames Street, Waltham 54, Mass.

B. C. AMES CO.

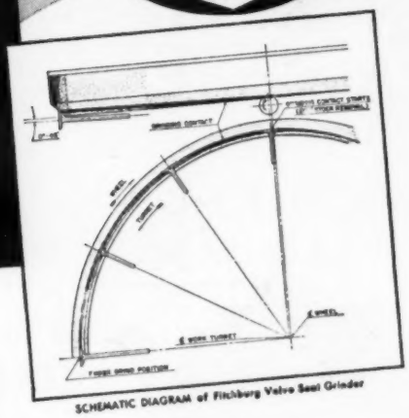
Mfr. of Micrometer Dial Gauges
Micrometer Dial Indicators

Representatives in principal cities



PRODUCTION IS 4 TO 10 TIMES GREATER on a FITCHBURG

CONSTA CONTAC GRINDER



SCHEMATIC DIAGRAM of Fitchburg Valve Seat Grinder

A BASICALLY NEW, MORE PROFITABLE METHOD FOR MASS-PRODUCTION CYLINDRICAL GRINDING

THE SIMPLE PRINCIPLE: Work pieces are automatically fed into 12 quill-type spindles on the periphery of a rotating turret. For one-quarter revolution of the turret, each rotating piece bears against the rotating wheel face. The pieces are automatically released on the downward arc and conveyed out of the machine. THE GRINDING PROCESS IS CONTINUOUS and the relative position of the turret and the wheel gives AUTOMATIC SELF-ADJUSTING FEED and AUTOMATIC SIZE CONTROL.

THE COST-CUTTING PRODUCTIVE RESULT: The FITCHBURG CONSTA-CONTAC Valve Seat Grinder shown above will grind the seats of automotive valves—from the rough forging to the finished size—without any necessity to deburr—*at the rate of 2160 per hour*—a rate vastly greater than possible by any other present method.

The inherent speed and economy of CONSTA-CONTAC GRINDING is best utilized in comparatively large-scale production. Present capacity is any part that can be chucked that is not greater than 3" dia. x 7" long.

Your inquiry for further information about CONSTA-CONTAC GRINDING—and a possible application of this new profitable grinding principle to your products—is invited.

Features:

- ★ No "grinding air" time loss—3 or more parts are always "sparking" (the greater the stock removal, the more parts are "sparking".)
- ★ Automatic Size Control.
- ★ Actual sparking time is the same as that of other present methods—*but* CONSTA-CONTAC grinds 3 or more pieces in the sparking time required by one piece.
- ★ Work can be chucked or held on short centers.
- ★ Wheel can have both coarse and fine cutting surfaces—to rough- and finish-grind in one pass.
- ★ Wheel can be formed to grind several diameters and shoulders—exactly as in present-day formed-wheel grinding.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders

Goss & DeLeeuw

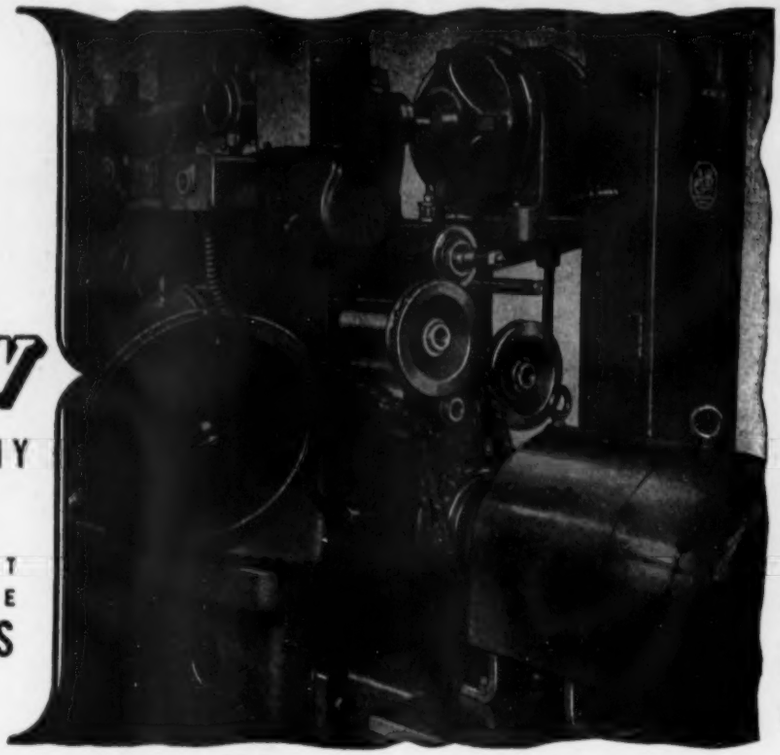
MACHINE COMPANY

KENSINGTON · CONN.

★

THE WORLD'S FINEST MULTIPLE SPINDLE

CHUCKING MACHINES



L-W MAGNETIC CHUCKS

GUARANTEED WATERPROOF FOR WET OR DRY GRINDING

MAXIMUM HOLDING POWER

LONG LIFE CONSTRUCTION

FOR OPERATION ON 110 OR 220-VOLT D.C.

5¼" x 13" **$47.65**

6½" x 18" **$63.15**

8" x 24" **$109.30**

10¼" x 37" **$202.05**

DEMAGNETIZERS

A single pass over the stationary poles is sufficient to completely demagnetize work that has become magnetized through induction. Model 8-2 for large work, complete with pilot light signal, switch and cord. Operates on 110 volts A. C. current. 7½" wide, 13½" long, 6½" high. Shipping weight 55 lbs. $63.20

Model 2-1 for small work, complete with switch and cord. 7½" wide, 7¼" long, 6¼" high. Shipping weight 35 lbs. $41.15

RECTIFIERS

For converting A.C. into D.C. for use on magnetic chucks. A.C. input 110 volts. D.C. output 110 volts. For continuous duty and long life. P-1 for 5¼"x13" chuck 0.8 amps.. $28.75

P-2 for 6½" x 18" chuck 1.0 amps.. $40.00. P-3 for 8" x 24", 10¼" x 37" chuck 3.0 amps.. $60.00.

DEMAGNETIZING SWITCHES

For use on our 5¼" x 13" and 6½" x 18" sizes. When the switch is thrown to "ON" position, the chuck is magnetized, and the work held firmly for grinding. When the work is to be released, the switch is thrown to "DEMAG." and contacts are touched momentarily to neutralize the chuck $8.90

Field discharge type for 8" x 24" and 10¼" x 37" $16.25

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 3500 ST. CLAIR ST. TOLEDO 4, OHIO

Uniform Accuracy

This dominant factor for extra savings in assembly time and cost is a part of every piece that makes up the complete line of Screw Machine Products

PRECISION MILLED by

SET SCREWS
CAP SCREWS
COUPLING BOLTS
MILLED STUDS
in all sizes and threads

WILLIAM H. Ottemiller CO.

York, Pennsylvania

Cut Turning Time in ½

with Nicholson

EXPANDING MANDRELS

Time studies show that, with these widely used precision tools, operations can frequently be completed in less time than was formerly consumed in locating or turning a solid arbor. Sold singly or in sets; for bores ½" to 7". Bulletin 1043.

W.H. NICHOLSON & CO., 114 Oregon St. Wilkes-Barre, Pa.

CUSHMAN CHUCKS

A World Standard for Precision

Here are some of the reasons why!

Pinions of hardened special analysis steel with tooth form processed to provide accurate alignment with the scroll gear.

Chuck bodies engineered to assure solidity, stiffness and jaw support and alignment without excess weight. Mounting faces precision machined.

Counter bore recess of bodies finished to extreme accuracy to guarantee correct alignment when mounted. Pratt & Whitney Electrolimit gages are used for testing these dimensions for Chucks designed for American Standard Type A-1, Cam Lock Type D-1 or Long Taper Key Drive Type E mountings.

Face of master jaws hardened and ground after assembly in chuck to provide accuracy in alignment of special top jaws. Cross key slot finished to American Standard tolerances providing accurate location of top jaws.

Scrolls of self centering chucks are cut on our own specially designed machines after heat treatment. This method insures precision lead of scroll thread and toughness to withstand chucking stresses.

Accuracy of finished chucks tested and held to within .003" total indicator error. Chuck bodies accurately balanced.

Consult CUSHMAN

Chucking Engineers Since 1862

THE CUSHMAN CHUCK COMPANY
HARTFORD 2, CONN.

AO Sta-Set Finger Cots are

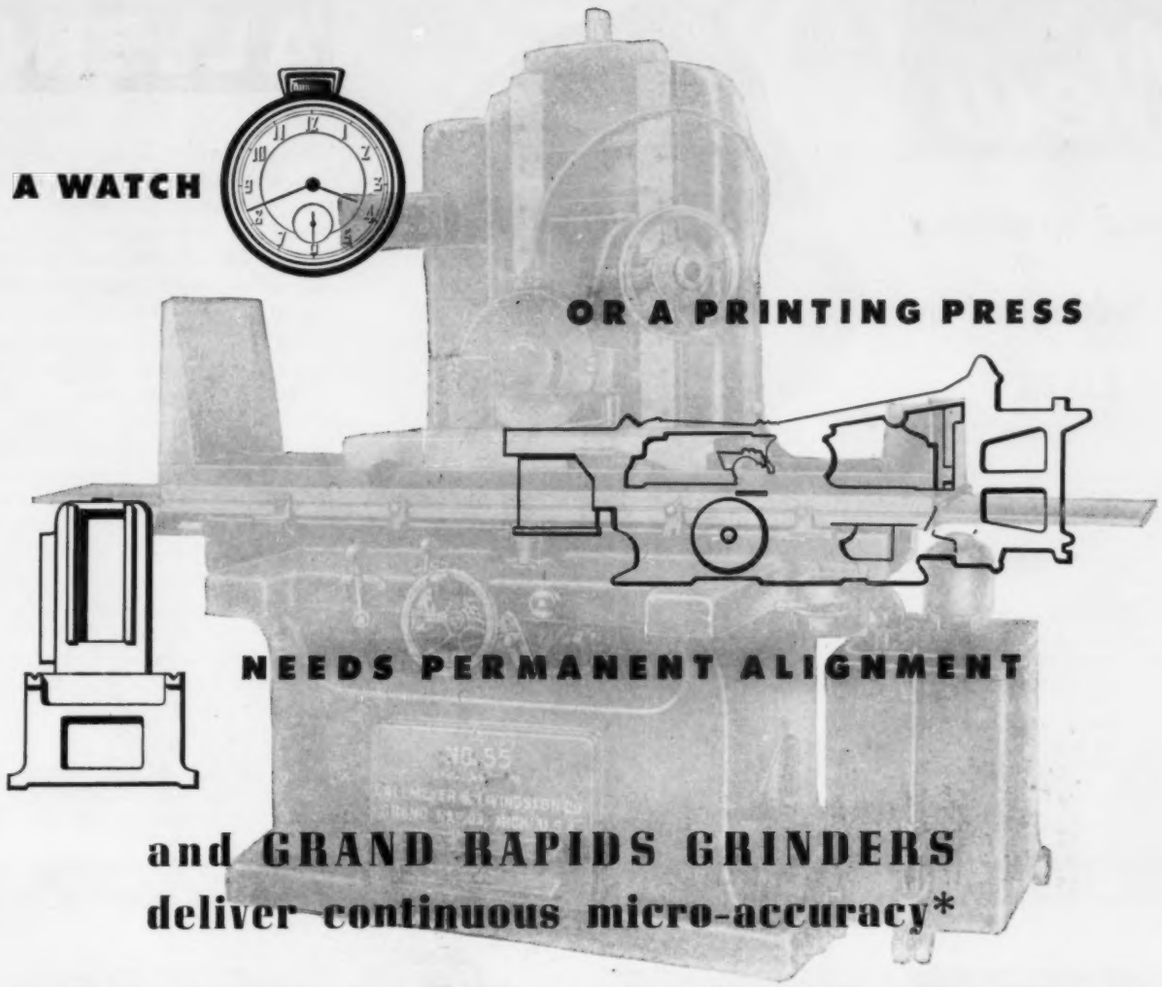
"Tailored To The Job"

These AO Finger Guards are built to the same protective, comfort, and "tailored-to-the-job" standards as the larger items of AO Safety Clothing. The 8X141 Finger Cots, made from soft, flexible grain leather, are ideal for jobs where sensitivity of touch is a must, as in soldering small wire. For jobs such as polishing, burring and grinding small parts, where rough usage is customary, companion Finger Cot 8X142 of chrome tanned split leather is recommended.

AO Finger Cots stay put on the finger! They are held in place by an elastic strap which allows full freedom of finger movement. Available in small, medium or large sizes. Your AO Safety Representative can give you speedy delivery.

Safety Division of American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



and GRAND RAPIDS GRINDERS deliver continuous micro-accuracy*

Permanent accuracy is essential in making delicate watch mechanisms or printing press sub-assemblies — as well as in the production of thousands of metal parts, from heavy machinery to electric shavers. And permanent accuracy is only one of the important reasons why you find Grand Rapids Grinders in so many leading plants.

The micro-accuracy of Grand Rapids Grinders comes, in part, from Gallmeyer & Livingston's unique method of making a massive, one-piece column and base casting. This unit casting of close-grained gray iron achieves the vibrationless rigidity which assures permanence of alignment between cross-travel ways and vertical head ways.

You get other assurances of long-life accuracy in Grand Rapids Grinders, such as: patented vertical head adjustment; powered vertical travel of wheel head; flanged type, pre-loaded ball bearing spindle; Bijur, one-shot lubrication; vane type hydraulic pump with special control valve; and the fastest longitudinal table speed available in any grinder.

*accuracy within 0.00025 limits.

TO SERVE YOU — *Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Tap Grinders, Drill Grinders, and Combination Tap and Drill Grinders.*

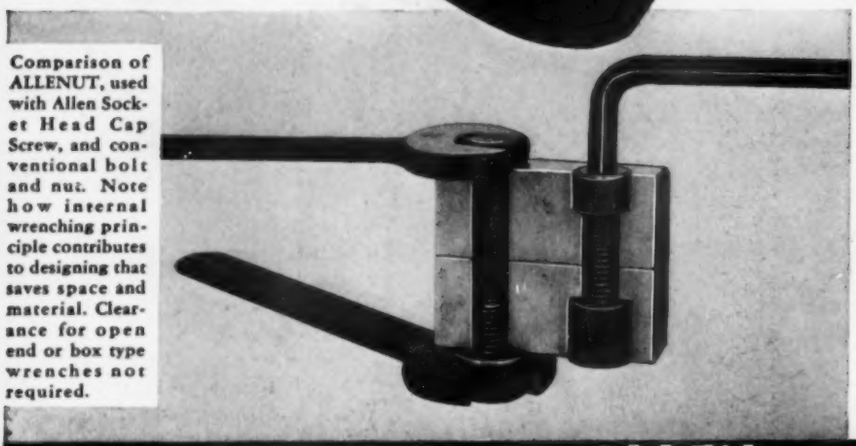
GALLMEYER & LIVINGSTON COMPANY

330 Straight Ave., S. W., Grand Rapids 4, Mich.

GRAND RAPIDS GRINDERS

New

internal wrenching self-locking nut by ALLEN



Comparison of ALLENUT, used with Allen Socket Head Cap Screw, and conventional bolt and nut. Note how internal wrenching principle contributes to designing that saves space and material. Clearance for open end or box type wrenches not required.

ALLENUT

This new internal-wrenching nut *holds* with a weld-like grip,— *self-locking* in non-hardened metals. Knurled flutes are drawn down into counterbored hole as screw is tightened in nut. Yet easily removed without damage to nut or containing parts by backing off on screw and tapping screw on head.

Using *ALLENUTS* with Allen Socket Head Cap Screws, the positive *internal* wrenching action of Allen Hex Keys drives fast, firm set-ups in the harder metals. 12-point (double-hex) Allenut socket gives 30° of wrenching swing — as compared with a normal 60° — to speed up assembly in cramped quarters.

The *ALLENUT* sets up *flush* to achieve streamlined surfaces. It facilitates more compact designs with resulting economies in space, weight and material. Adds immensely to the finished appearance of any job... Precision-made of special-alloy steel to Allen standards; threads tapped to a Class 3 fit.

Ask your local Industrial Distributor for samples for test applications. Available only through authorized ALLEN Distributors.

The Allen Mfg. Company ★ ALLEN ★ Hartford 1, Conn., U. S. A.

These

"EDUCATED DIAMONDS"

can't come loose!

How would you like a dresser that really *holds* its diamonds?

Here's one that will do it—thanks to its matrix of Carboloy Cemented Carbide.

What's more, this special carbide matrix makes it possible to use small, inexpensive diamonds—and *you* get the savings.

Are you interested in savings of up to 40% in your dressing costs? Let us send you our free brochure, "The More Profitable Use of Diamonds for Dressing Grinding Wheels." Ask for brochure No. DR-480. *Carboloy Company, 11149 E. 8 Mile Street, Detroit 32, Mich.*

DIAMOND DRESSERS by CARBOLOY ®

Sensitive DRILLING MACHINES

Avey

CINCINNATI OHIO

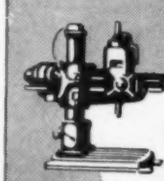
Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

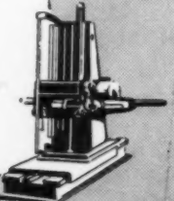
OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

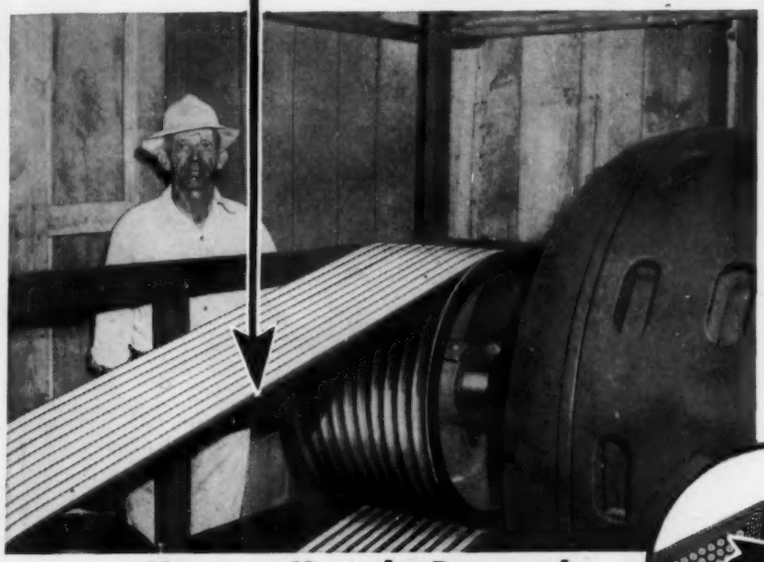
THE CINCINNATI GILBERT MACHINE TOOL CO.

CINCINNATI, OHIO

The SIDES of a V-Belt . . .

Diagram of V-Belt in Sheave Groove

Really DRIVE the Pulley
They PICK UP and DELIVER the POWER!
Naturally They GET the WEAR



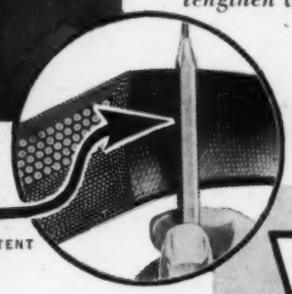
Anyone experienced with V-Belt drives knows that the *sides* of a V-Belt are what really get the wear.

It's the *sides* that grip the pulley. They pick up all the power from the driver pulley, transmit that power to the belt as a whole and then, once more, deliver the power to the driven pulley. Moreover, it's the sides that take all the wear against the sheave-groove wall.

That is why you have always noticed that the *sidewall* of a V-Belt is the part that *wears out first*—and, naturally, if you prolong the life of the sidewall, you *lengthen* the *life* of the *belt!*

Now see How the Patented Concave Side

A GATES PATENT



SAVES Sidewall Wear ...Lengthens Belt Life

The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the *middle* of the sides. The diagrams show also why the Patented Concave Side greatly *lengthens the life* of the *sidewalls* of Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belt can possibly give.

Saving SIDEWALL WEAR is more important NOW than ever before.

Now that Gates *SPECIALIZED* Research has resulted in Super Vulco Ropes capable of carrying much heavier loads—fully 40% higher horsepower ratings—the sidewall of the belt is called upon to do even more work in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important now than ever before!

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley.

No bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

THE GATES RUBBER COMPANY *"The World's Largest Makers of V-Belts"* DENVER, U.S.A.

484

Gates

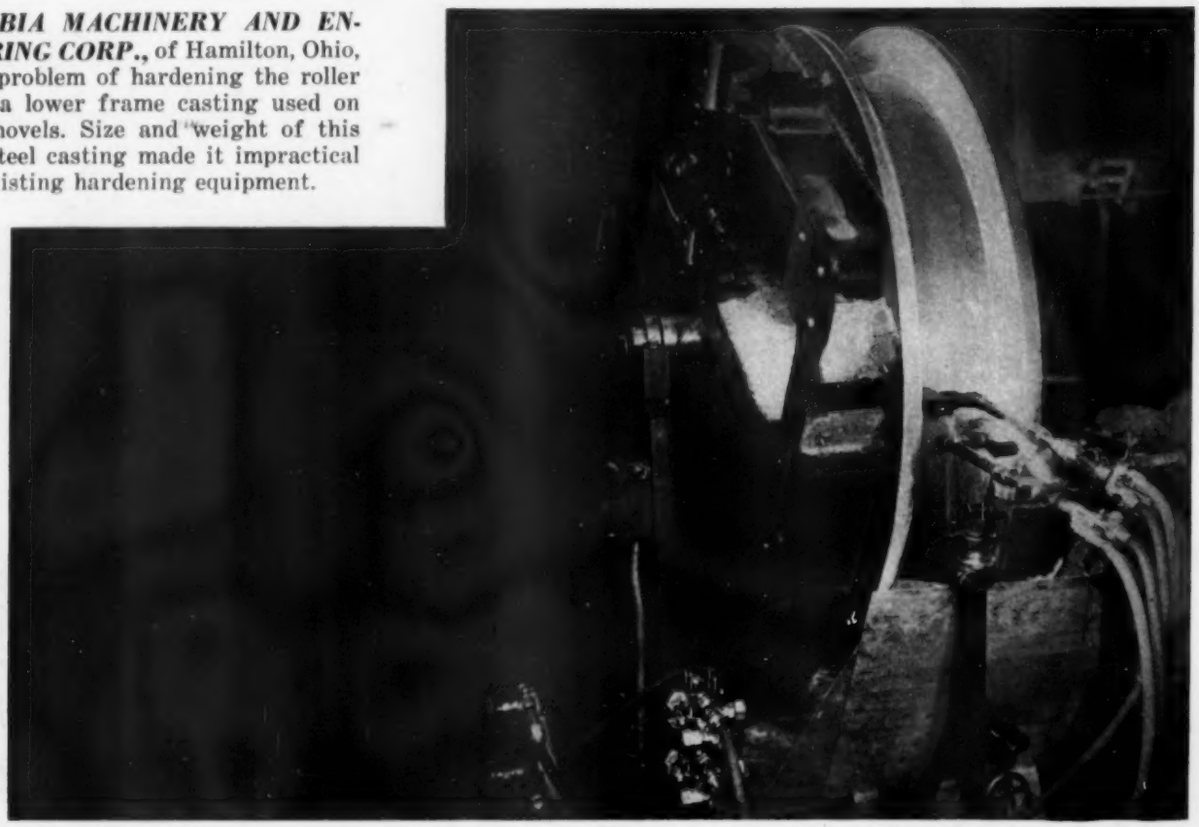
The Mark of SPECIALIZED Research

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

3400 pound steel casting flame hardened in 25 minutes

COLUMBIA MACHINERY AND ENGINEERING CORP., of Hamilton, Ohio, had the problem of hardening the roller pads of a lower frame casting used on power shovels. Size and weight of this special steel casting made it impractical to use existing hardening equipment.



D. P. CAREY, Airco Technical Sales Representative, suggested building a fixture for positioning and rotating the castings and for mounting the torches and accessory equipment. Using this special equipment, which rotates the 3400 pound casting at a speed of 7 inches per minute, the hardening cycle is accurately controlled and requires only 25 minutes. Two torches simultaneously flame harden both the upper and lower faces of the roller rings to a depth of 3/32 inches.

Thus, the hardening operation easily keeps pace with the rest of the shovel manufacturing and has more than proved entirely satisfactory.

TECHNICAL SALES SERVICE — ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

Technical Sales Service—though not a packaged commodity—is as readily available to all industry as any Airco process or product. If you have a metal working problem, ask to have a Technical Sales Division man call. Address Dept. 8419, Air Reduction, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., Houston 1, Texas. On West Coast: Air Reduction Pacific Company, San Francisco 4, California.

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ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

for Rapid, Accurate Work in Tool Rooms, Laboratories and Development Departments

The problem today is to produce parts to exacting close tolerances at low cost. The DV 59 Hardinge High Speed Precision Lathe has the perfect combination of accuracy and speed together with rugged construction so necessary for lasting precision. Simplicity of operation enables relatively-unskilled operators to produce parts to close limits.

Optical accuracy is now necessary for industry generally — that is why the Hardinge hardened and ground steel dovetail bed construction, standard for special accuracy lathes for the optical industry, is now featured for Hardinge precision lathes. Write for Bulletin DV 59 which presents full particulars about this greatest advance in precision lathe construction.

SPECIFICATIONS

1" collet capacity, 9" swing, 17" center distance, 8 spindle speeds up to 4000 r.p.m.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Offices in principal cities. Export Office, 269 Lafayette St., New York 12, N. Y.

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CHICAGO
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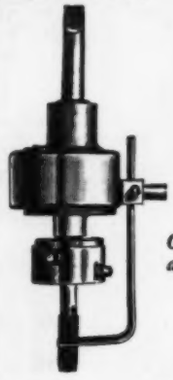
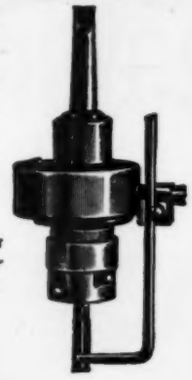
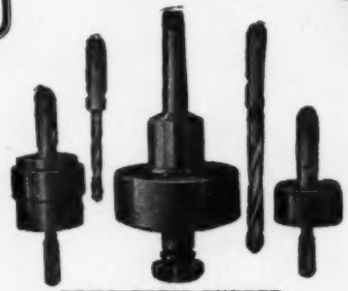
Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛" ⅛"
" 0	3/16" ¼"
" 1	1/16" ¾"
" 2	3/16" 1 "
" 3	5/16" 1¼"
" 4	¾" 1½"
" 5	¾" 2 "



Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down



Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

For Faster Smoother Cleaner Grinding ECONOMY

Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

THE WHITE & BAGLEY COMPANY
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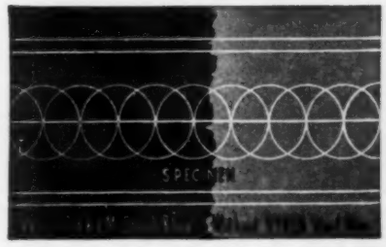
STOPS LOSSES making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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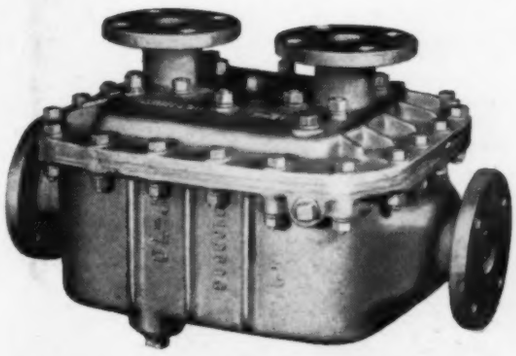
Sure, You Hate Waste . . .

But wouldn't you rather WASTE HEAT than waste production time?

Production men fight a constant war on waste. Yet, they turn to Harrison Oil Coolers to *waste heat*—the excess heat that is the enemy of uninterrupted production. Top efficiency in machines, using lube oil, cutting fluid and hydraulic oil, depends in a large measure on getting rid of surplus heat.

That's what Harrison Oil Coolers are designed to do—with the right size and model for every type of industrial application.



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HARRISON

HARRISON RADIATOR DIVISION OF GENERAL MOTORS • LOCKPORT, NEW YORK

Leak Proof!

The Parker 3-Piece Fitting

HOLDS BEYOND TUBE-BURSTING PRESSURES

Even if used under pressures severe enough to burst the tubing, PARKER *3-Piece* Tube Fittings remain intact . . . and do not leak or distort. Pictured is just one sample from thousands of tests that have been made—all with the same leakproof performance result.

PARKER Tube Fittings control vibration better. They're easy to assemble . . . may be reassembled repeatedly. Shapes are machined from high-strength forgings. Offered in the widest range of shapes and sizes in brass, steel, stainless steel—and aluminum. Two styles—*3-Piece* flare-type and flareless Ferulok. Warehouse stocks conveniently located in all major industrial centers.

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STITCH METAL LIKE PAPER

with the Acme-Morrison Metal Stitcher

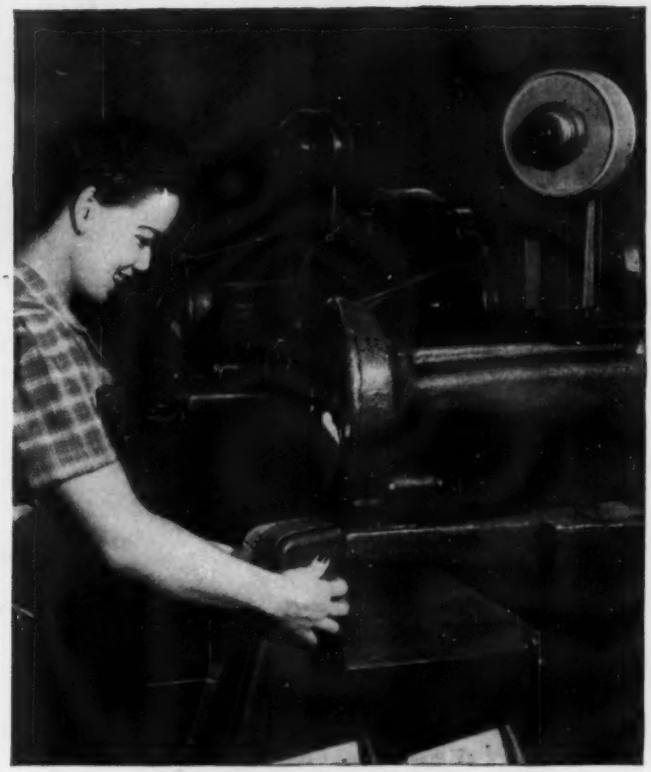
No pre-punching required. Replace rivets, screws, nails, bolts, spot-welding with wire stitches

Yes, sir, Acme-Morrison Metal Stitchers make stitches that Granny never dreamed of . . . stitches that save you time and money because they speed production, reduce material costs and eliminate costly operations.

Acme-Morrison Metal Stitchers fasten metal to metal, or non-metallic materials to metal.

The secret is a wire stitch which works like your office stapler. In a single operation this machine forms its own stitch (or staple) from a coil of wire, drives and clinches it. *No pre-punching is required.*

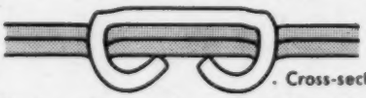
The Acme-Morrison Metal Stitchers come in several models and can be used advantageously in many industries. They will stitch aluminum, steel, copper, brass, bronze, certain grades of stainless steel, cork, asbestos, rubber, wood, canvas, and other materials.



Acme-Morrison Metal Stitcher stitching together composition board and impregnated fibreboard. A steel support is also stitched to this assembly.

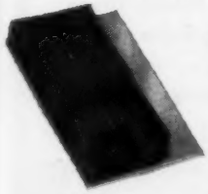
For further details about what these time-saving, money-saving Metal Stitchers can do for you, mail the coupon today.

A metal-to-metal stitch looks like this

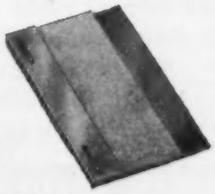


Cross-section view

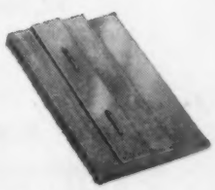
A few of many combinations



Textile stitched to aluminum



Aluminum, leather and copper stitched together



Aluminum, plywood and brass stitched together

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ACME STEEL COMPANY

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. . . Just Connect to Gas Supply

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Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

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The Modern Way

Illustration shows typical set-up for cutting taper keyway with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

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All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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Save Hands Speed Production with—

LITTELL

Pres-Vac Safety Feeder

KEEP workmen's hands out of Danger Zone. Use PRES-VAC Safety Feeders to keep hands safe, improve quality and speed production. Pres-Vac acts on trigger-vacuum principle. Picks up—drops—material instantly. Uses compressed air, 10 to 45 lbs. pressure.

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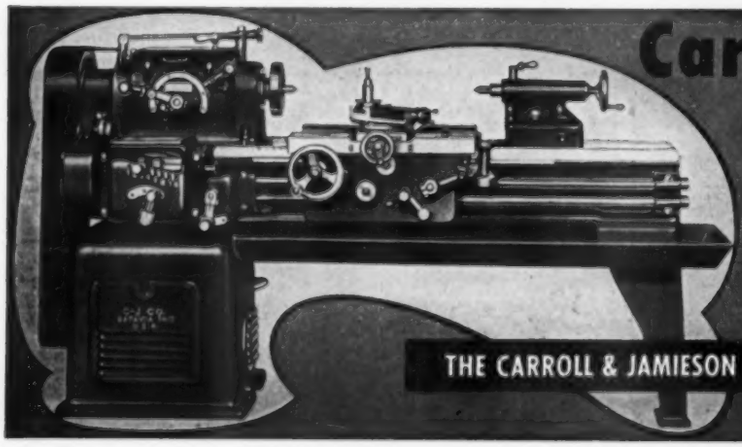

Carroll & Jamieson 16" LATHE

12 Speed Geared Head Motor Drive
Timken Mounted Spindle
Modern Design—
Liberal Dimensions

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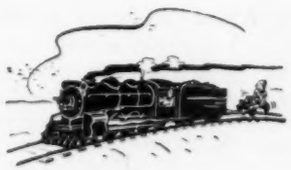
THE CARROLL & JAMIESON MACHINE TOOL CO., BATAVIA, OHIO, U. S. A.

If your Costs are Hurting Profits

SHELDON

T-S56 PRECISION LATHES

Costs are becoming more important, and a lot of extra cost is built-up when you turn small parts on large expensive lathes that could be machined easier, faster and cheaper on a small moderate priced SHELDON T-S56 Precision Lathe. This difference in operating cost is a substantial factor in ultimate profit, especially when with the same tool investment and the same power cost it is possible to have more lathes and multiplied output.



You don't need a locomotive to pull a child's wagon.

SHELDON T-S56 Precision Lathes have 11¼" Swing, 1" Collet capacity, 56" bed. They have "Zero Precision" Taper Roller Bearings and retain their accuracy under long hard service.

Write for Catalog describing the T-S56 and other SHELDON Precision Machine Tools

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

Only PHILLIPS

RECESSED HEAD SCREWS

have driver sizes engineered in balance with ALL screw sizes for PRACTICAL PRODUCTION DRIVING

Phillips Practical Engineering, based on exhaustive tests of actual driver requirements on the assembly job, proved 4 sizes of recesses and drivers the fewest possible for dependable efficiency in driving the complete range of sizes of cross recessed head screws.

One Driver Size is adequate for most jobs, however, because the great majority of production assemblies use screws in the Phillips No. 2 recess and driver size range.

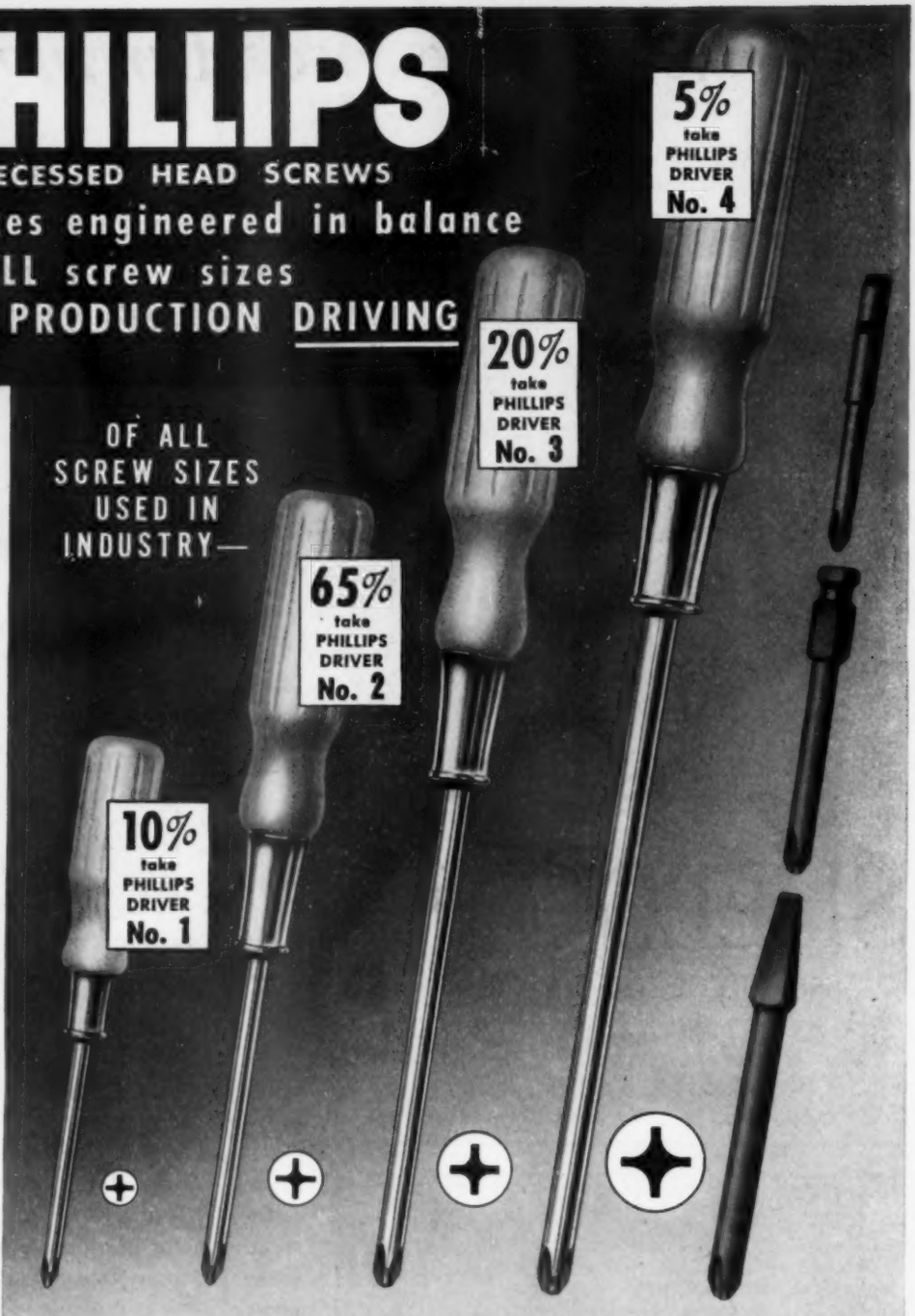
About 25% of Screws used in production assemblies are bigger than those in the popular No. 2 size range. 20% have Phillips No. 3 size recess, and the proper balance essential to efficient driving is provided by the Phillips No. 3 size driver.

For the Few Heavy Duty screws used, (5%), you need a driver and recess size balanced to obtain the required torque and fastening security, — Phillips No. 4. Using a driver suited to smaller screws is like using a tack hammer on a railroad spike.

For Small Size Screws, you want a small driver (No. 1) in proper *balance* to prevent overdriving, stripping threads, or straining screw head. You wouldn't use a driver big enough to drive a ½" diameter screw, any more than you'd use a sledge hammer to drive a tack.

Phillips Screws not only promise, but *deliver* all the advantages of cross recessed head screws. Ask for Phillips when you order.

OF ALL SCREW SIZES USED IN INDUSTRY—



DRIVERS AND BITS SHOWN HALF SIZE — RECESSES ACTUAL SIZE

THE PHILLIPS DRIVER AND SCREW are in perfect balance, whatever the size. Less than 4 recess and driver sizes would have meant weakened heads in some screw sizes — would have encouraged overdriving to weaken the screw, or underdriving to lessen assembly strength.

By varying the length and diameter, the same balance is assured in bits for hand brace, spiral, and power driving.

GET THIS HELPFUL BOOKLET

Phillips Screw Mfrs., c/o Horton-Noyes Co.
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Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name .....

Company .....

Address .....

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PHILLIPS *Recessed Head* SCREWS

Wood Screws · Machine Screws · Self-tapping Screws · Stove Bolts

25 SOURCES

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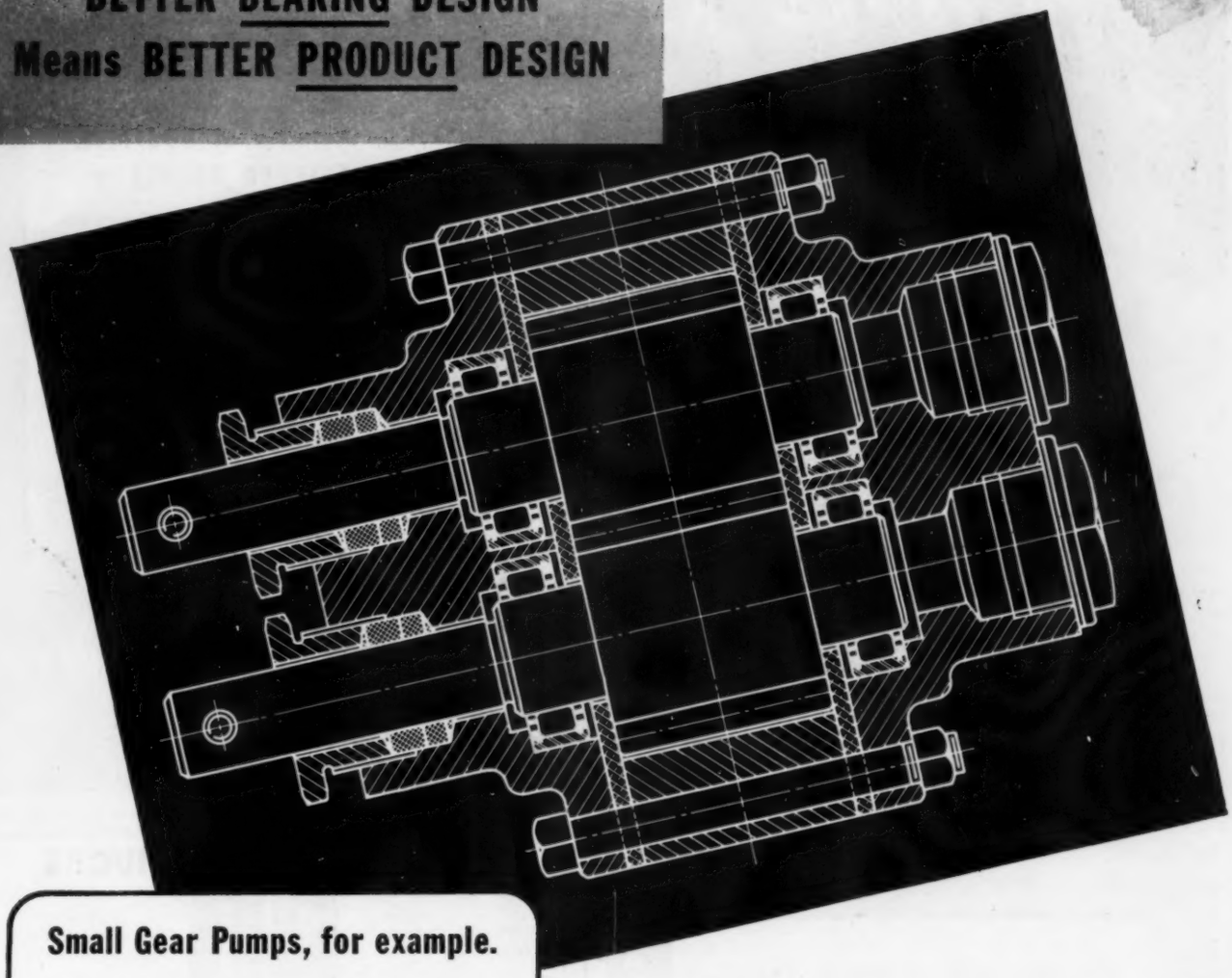
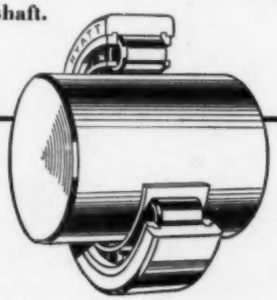
BETTER BEARING DESIGN
Means BETTER PRODUCT DESIGN



Small Gear Pumps, for example.

Shorter distance between the shaft centerlines, without sacrificing shaft diameter—free floating shafts, permitting pressure balancing—and ease of assembly—are features which add to the overall compactness and efficiency of this design. Hyatt Hy-Load Roller Bearings made it possible because they have greater radial load capacity than any other bearing of the same standard size and type. And Hyatt design permits omission of the bearing inner race—thereby, either reducing the required bearing O.D. space, and/or permitting the use of larger shaft.



Better design and better performance—not only in gear pumps, large and small, but in virtually every type of industrial equipment—is a "matter of record" where Hyatt Roller Bearings are used. That's because fitting the bearing to the job—not the job to the bearing—is the Hyatt way of engineering.

Thus, when Hyatt Roller Bearings are built into a machine, you have the assurance that the bearing is planned, manufactured and applied for your specific requirements. Hyatt Engineering Service is at your disposal without cost or obligation. Address Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

Mac-it ALLOY STEEL SCREWS

Insure smoother operation at POSITIVE levels with STRIPPER BOLTS!

Mac-it Stripper Bolts or Shoulder Screws have greater holding power where you want it in die-assemblies. They are also used as stud bolts and in various machine assemblies. Easily tightened with Mac-it Key. Will not work loose. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

DISTRIBUTED NATIONALLY BY
STRONG, CARLISLE & HAMMOND COMPANY
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This Business of Making Holes

Probably the making of holes in one way or another accounts for more machining operations in the metal-working industries than any other type of stock removal. Mass production cannot be maintained unless fast, accurate equipment for the precision machining of holes is on the job constantly. That is why, since 1901, metal-working shops have been using MOLINE HOLE HOG cost-reducing equipment in production work.

For such operations as Boring, Milling, Straight Line Drilling, Universal Adjustable Spindle Drilling, Honing, Tapping, Reaming and Counterboring, or for ANY special problem, a Moline "Hole Hog" can do it for you faster at less cost.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20th Street Moline, Illinois

ALMOND DRILL CHUCKS

Maximum Gripping Power with Extreme Accuracy and Long Life
Write for Catalog
T. R. ALMOND MFG. CO.
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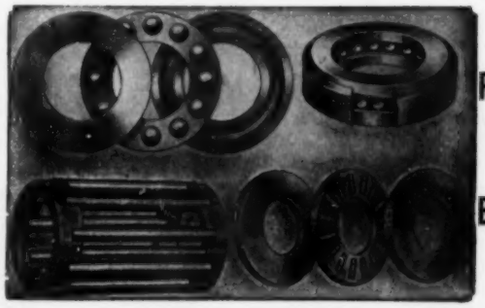
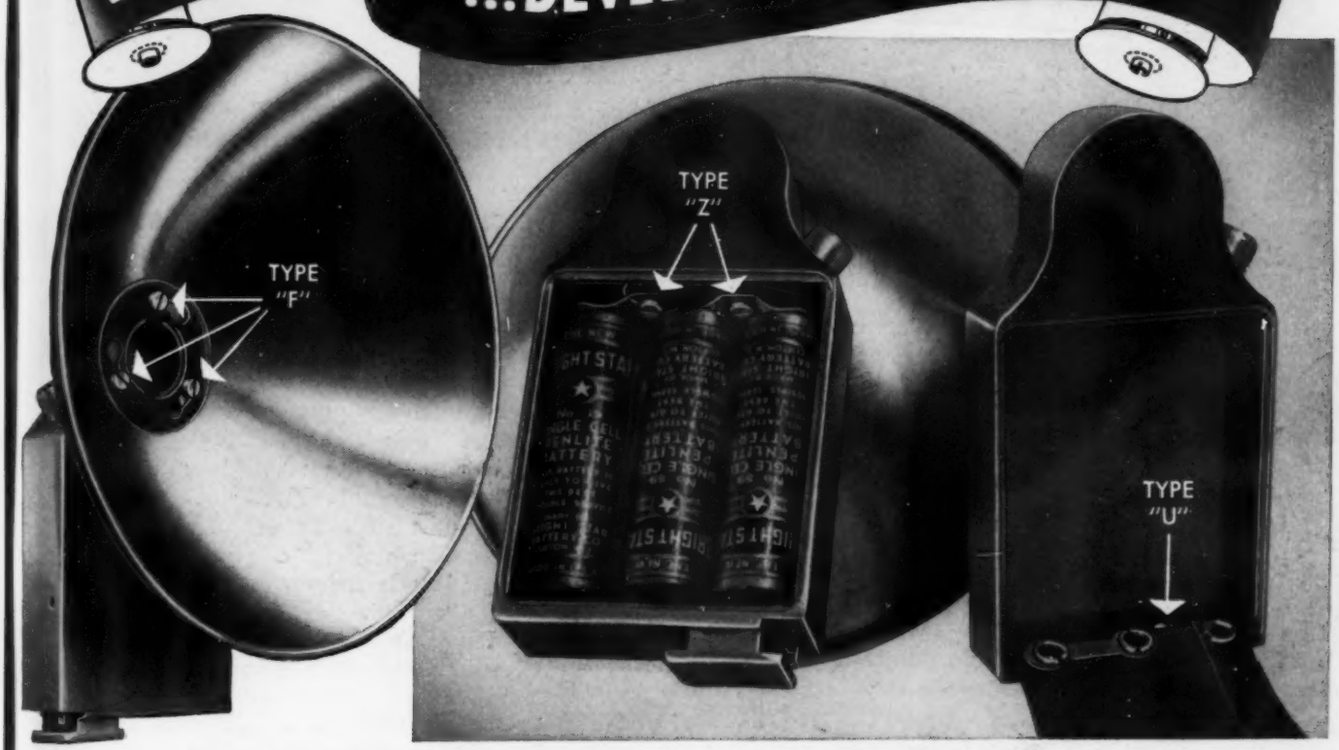


PRECISION B&RB BEARINGS

Place your order for B & R B Precision Bearings. Deliveries and Service Dependable.

THE BALL & ROLLER BEARING CO., Danbury, Conn.

COMMON SENSE ASSEMBLY ENGINEERING... LIGHTS UP WASTE IN TAPPING ...DEVELOPS A 50% SAVING



The polished reflector is fastened to the cast aluminum case of the synchronizer with three Binding Head P-K Type "F" Self-tapping Screws. One operation completes the fastening—simply driving the screw in plain, untapped holes. Type "F" cuts its own threads... can be removed and reinserted without impairing security.

The battery springs are fastened to the case with two Binding Head P-K Type "Z" Self-tapping Screws. Holes for these screws are drilled at a 12½ degree angle. When machine screws were used, tapping was difficult, and the fastening frequently loosened. One P-K Type "U" Screw is used for fastening the insulating sheet to the case.

When Jen Products Co. started assembly of their handy JEN-FLASH synchronizers with machine screws, they soon found fastening costs running too high. By changing over to P-K Self-tapping Screws, they achieved an assembly saving of 50%, and greatly improved product strength.

With direct costs of assembly the highest ever, now is a good time to *question every fastening* in your operations. Find out if you are missing the obvious savings of the P-K "short-cut" method. In 7 out of 10 assemblies studied, P-K Screws permitted savings up to 50% by eliminating tapping, nut-running, riveting, and other needless operations.

Ask a P-K Engineer to tell you how you can apply these advantages, or, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors

PARKER-KALON

P-K*

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SELF-TAPPING SCREWS

OTHER PARKER-KALON PRODUCTS

COLD-FORGED SOCKET SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS • SHUR-GRIP FILE AND SOLDER IRON HANDLES • METAL PUNCHES • DAMPER REGULATORS AND ACCESSORIES

You Can Speed Your Production With This Wade Precision Lathe

WADE No. 8-A
TOOLMAKERS' PRECISION LATHE SPECIFICATIONS

Length of Bed	44"
Distance between Centers	24"
Swing over Bed	8½"
Swing over Cross Slide	5½"
Swing over Compound Slide	2½"
Size of Tools	⅜" x ¾"
Cross Slide Travel	5"
Tailstock Spindle Travel	3¼"
Compound Slide Travel	2½"
Collet Capacity	1"
Taper Standard for Centers	No. 2 Morse
Width of Driving Belt	1¼"
Clear Hole through Spindle	1 3/16"
Spindle Nose, Hardened and Ground Threads	2" x 10 TPI
Height above bench to center line of Spindle	12"
Weight, net	1075 lbs.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

You can speed your production with this Wade No. 8-A Toolmakers' Precision Lathe because it is precision-built for precision work . . . enabling your men to work faster, with greater accuracy and with less spoilage.

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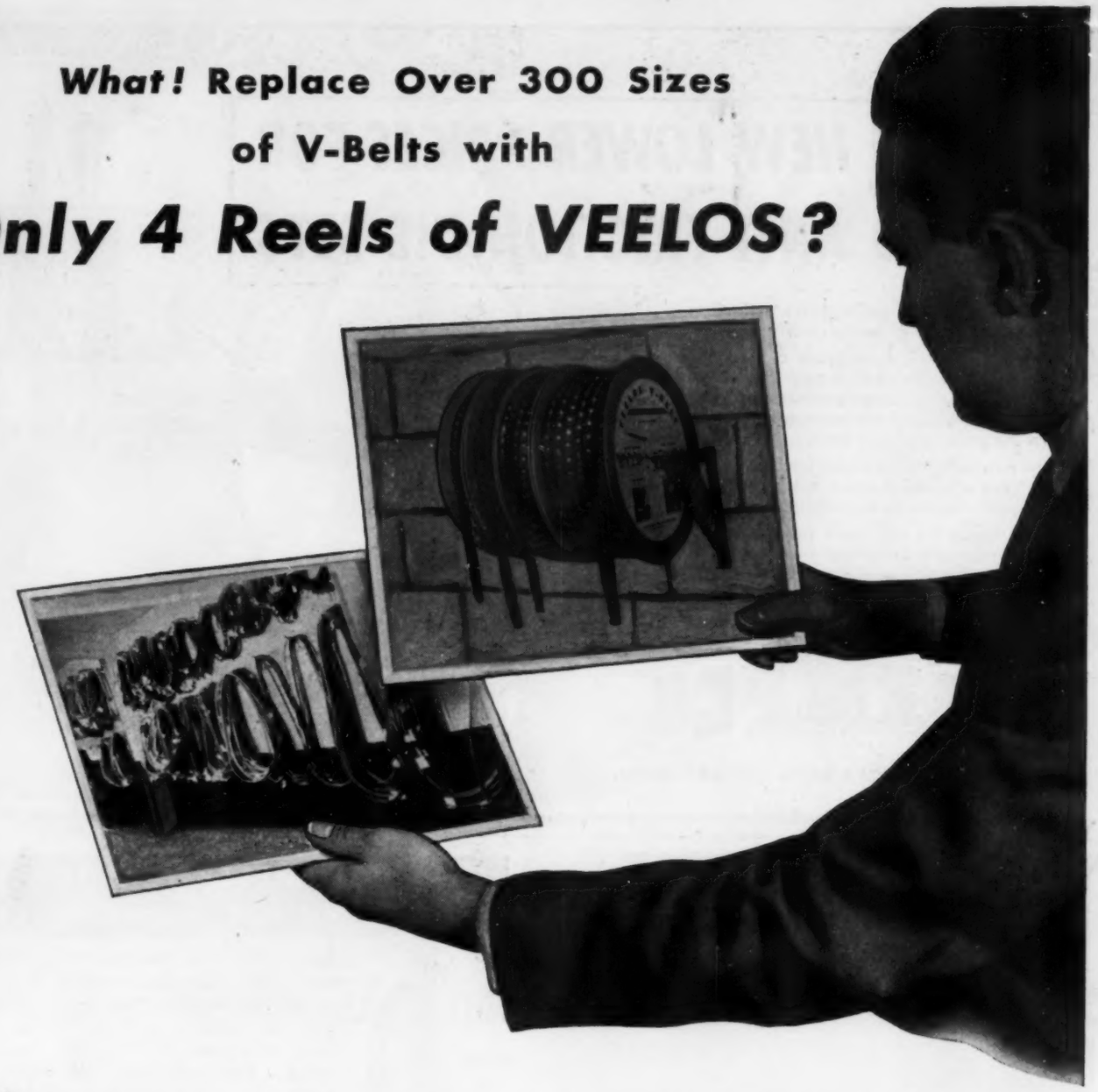

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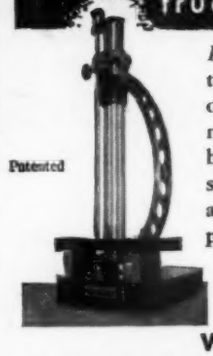

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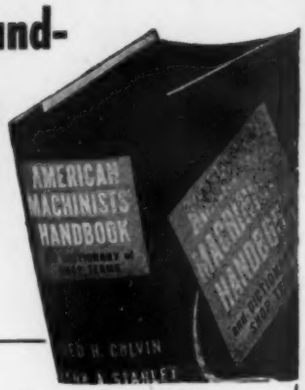

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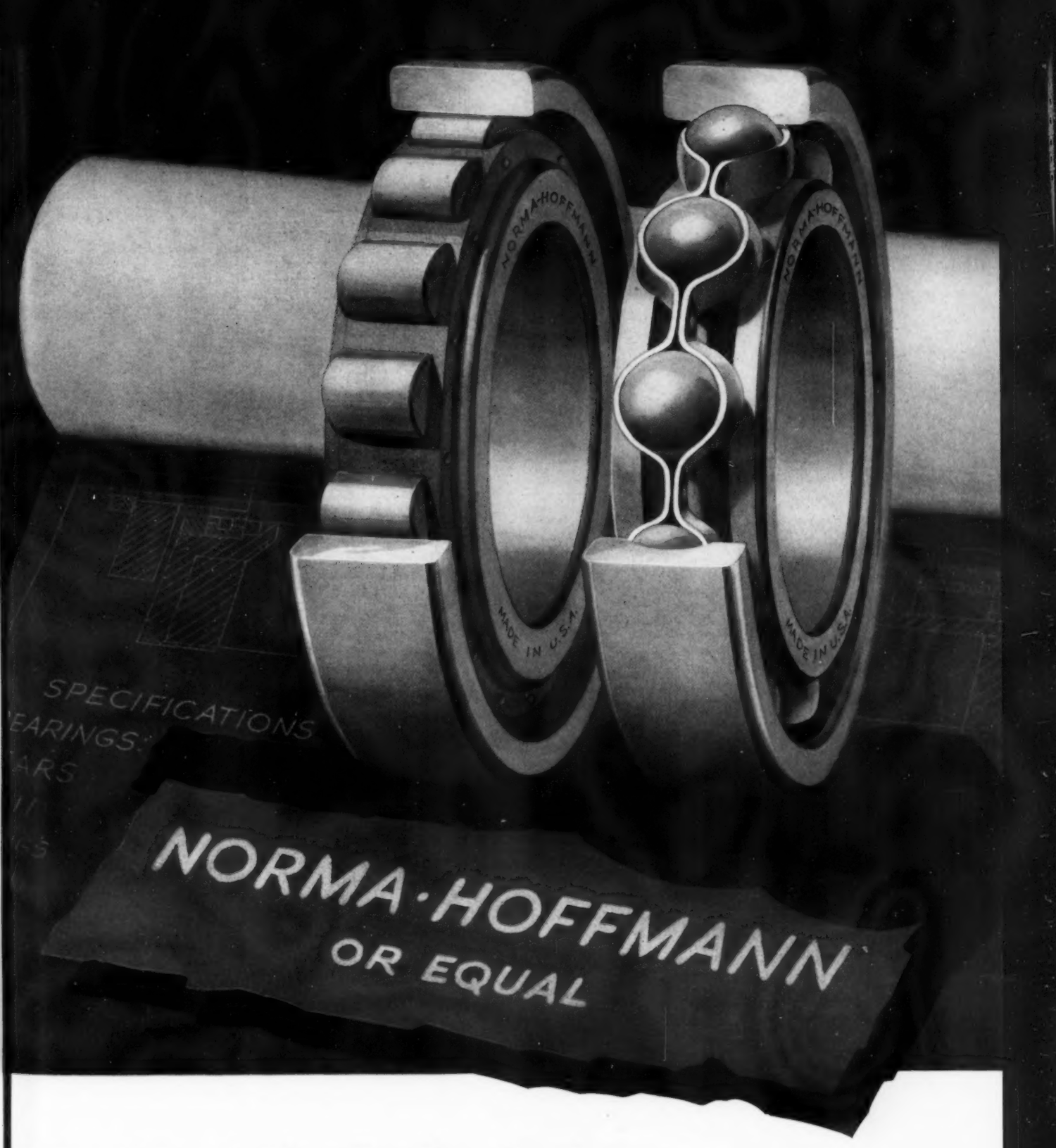

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Cincinnati No. 4 Vert. H. P. Mill. Motor Drive.
Cincinnati No. 5 Horiz. H. P. Mill. Motor Drive.
Cincinnati No. 3 Horiz. H. P. Mill. Motor Drive.
Cincinnati No. 3 Dial Type H. S. Vertical Mill. M.D. Equipment.
Brown & Sharpe No. 1Y Pl. Horiz. Mill.
Becker No. 5C Vertical Mill. Range 42"x12"x12".
Pratt & Whitney Duplex Mill. Turner Dr. 3-60-220
Milwaukee No. 1½ Pl. Horiz. Dble. Overarm. S.P.D. Braces—Arbor.
Van Norman No. 2 Duplex Mill. Collets & motor

Heald No. 49 Single End, Two Head Borematic. Arranged direct current motor drive. Series 200 Spindle Heads. Universal Fixture on hand feed cross slide. Complete coolant system.

PUNCH PRESSES

Clearing, S.S. 200 tons Cap. 10" stroke.
Caldwell 200 tons Horiz. Hydr. Wheel Press.
Bliss No. 21 O.B.I. 35 tons, 2" stroke. M. Dr.
Bliss No. 18 O.B.I. 11 tons, 2" stroke. M. Dr.
Ferracute No. EG52 Coining Press. 150 tons.
General Flexible Power Press. 8 tons, M. Dr.
Stiles O.B.I. 14 tons, 1½" stroke.
Bliss No. 68C Dble. Action, Gap Frame.
Lucas 15 tons Power Arbor Press. M. Dr.
Hub O.B.I. 15 tons, 2" stroke. M. Dr.
Tompkins & Johnson Power Arbor Press.
McCall No. 4 O.B.I. 2½" stroke, 20 tons.

DRILLING MACHINES

Natco No. 12, 20 Spdles. 3/16" Cap.
Natco No. D6, 24 Spdles. 5/16" Cap.
Natco No. D5, 14 Spdles. 5/16" Cap.
Fox No. 15, 54 Spdles. No. 1 m.t.
Minster No. 2D, Sgle. Spdle. Upright, compound table, No. 5 m.t., heavy duty
Cinci.-Bickford, 3½' arm, 9" col. Radial
Cinci.-Bickford, 5' arm, 13" col. Radial
Fosdick, 5' arm, 14" col. Radial
Cinci.-Bickford, 6' arm, 15" col. Radial
Fosdick 4' arm, 11" col. Radial

SHAPERS & PLANERS

Pratt-Whitney Vert. Shaper, 6", M. Dr.
Logan 7" Horiz. Shaper, Motor Drive
Machinery Sales 16" Crank Shaper
Gould & Eberhardt 16" Crank Shaper
Gould & Eberhardt 24" Crank Shaper
American 24" Crank Shaper, Motor Dr.
New Haven 12" Vertical Shaper
Whitcombe, 24x24x6 Planer
Niles-B-P, Shaper Planer, 20x20x24
Ingersoll Planer Type Mill 30x30x16
Betts, 120"x72"x35' Planer

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe Full Automatic, Standard Speed
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle
1—No. 515 National Acme 9/16" 4-spindle Automatics.
1—No. 2 Brown & Sharpe Auto.

LATHES

14"x6' Hendey
15"x5' Sebastian
18"x6' American
22"x48" centers Monarch (1942)
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
50"x17' centers LeBlond (1942)

8"x15" Sundstrand, Model B (1942)
8"x15" Sundstrand, Model D (1943)
8"x15" Sundstrand, Model E (1940)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
24" Cincinnati Production
No. M-18 Milwaukee Simplex
No. M-24 Milwaukee Simplex
No. 18-48 Milwaukee Simplex
No. 1-18 Cinn. Mig. (1940)
No. 2-18 Cinn. Rise & Fall (1941)
No. 2—18" Sundstrand Electromil (1942)
No. 2—24" Cinn. Rise & Fall (1944)
No. 4—36" Cinn. Hydromatic (1942)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Duplex Tracer (1943)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 58-90 Cinn. Hyd. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
4" Taylor and Fenn Spline, M.D.
No. 15 Ingersoll Traveling Col. Face Miller

ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

Reg. U. S. Patent Office

24"x24"x12' Ingers Adj. Rail
72"x48"x12' Ingers Adjustable Rail

DRILLS

No. 121 Baker
No. D-8 Colburn No. 6 M.T.
No. 3MS—24"—1 Spdl. L.G.
No. 2LMS—20" 2 Spdl L.G.
No. 2LMS—26"—2 Spdl. L.G. (1945)
No. 2MA-6—15"—4 Spdl. Avey
No. 2LMS—26"—4 Spdl. L.G.
24"—4 Spdl. Demco
No. 2LMS—20"—6 Spdl. L.G.
No. 3B—24"—6 Spdl Eduund (1942)
No. 2—8 Spdl Leland-Gifford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS

34" King
42" Bullard New Era
52" King
72" Cincinnati
72" Niles Extra Heavy
84" Betts

HOR. BOR. MILLS

No. 3A Universal, 3" Bar
Rockford, 3½" bar
No. 32 Giddings & Lewis, 3½" bar
No. 360-F Gididngs & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

JIG BORERS

Model B Kearney & Trecker Autometric (1943)

GEAR MACHINES

No. 61-A Fellows Gear Shaper
No. 7 Fellows Gear Shaper
No. 71 Fellows Gear Shaer (1942)
No. 7125-A Fellows Gear Shaer (1942)
11" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

MISCELLANEOUS

No. 22-C Racine Shear Cut Hack Saw
No. 0 Bakewell Tapper
No. 20 Bliss O.B.I.

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 601 Oster Rapiduction (1942)
No. 4 Gisholt (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 6R Denver, A.C. & Bar feed
No. 1-H Libby, 6¼ Hole in Spindle (1937)
18" Libby, 3½" hole in spindle
No. 4A Warner & Swasey, 7½" Hole in Spdl.

GRINDERS

4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18' Cincinnati Plain (1942)
10"x36" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"
10"x24" Landis Type C Universal
12'x36' Landis Type LCH Universal (1945)
No. 5 Cvoel Hydraulic Surf (1941)
24"x24"x96" Mattison Hyd. Surf.
No. 34 Abrasive Surface (1943)
No.22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)
72A-3 Heald Internal Grinder (1943)
72A-5 Heald Internal Grinder (1942)
10"x72" Colonial Broach Grinder
No. 5—18" Besly Disc Gdr.

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AVAILABLE FOR IMMEDIATE DELIVERY

No. 3 Waterbury-Farrel punch press, app. cap. 20 ton, stroke 2½", ram adjustment, 60 strokes per min., shutheight 6½", bed size F to B 10½", R to L 14½", 1 HP motor, like new....$475.00

No. 6600 Waterbury-Farrel punch press, cap. 56 ton, vertical back geared, open back, straight sided, 6" stroke, 60 strokes per min., 20" shut height, distance between uprights, 46", bed size 10"x45", 5 HP motor, push button switches, V drive, late type....$1750.00

No. PG-6 Ferracute punch press, geared, 1¾" stroke, bed area R to L by F to B 34¾x23. Opening in bed R to L by F to B 16x14. Slide adjustment. Height Overall 103" $2750.00

U. S. Multimiller, model MM-1-5-2. Table 6"x21½", automatic vertical motion of spindle head 2", horizontal adjustment of spindle assembly 2¼", motorized, automatic lubrication system, Coolant pump and tank, little used late model machine $750.00

No. 5 Waterbury-Farrel blanking and cupping press, 4" stroke, open back, 25"x12" bed area, app. 20 ton cap., adjustable ram, ½ HP motor.....$380.00

No. 35P Toledo punch press, gap type, flywheel 48"x7", bed size 27"x18", stroke 1¾", 15" from bed to bottom of ram ways, 10 HP motor, Pitman strap and eccentric just rebuilt.....$1500.00

Model RA-6, six-spindle Acme-Gridley automatic, 9/16" bar cap., including tooling and equipment, serial No. 2237A, practically new $3950.00

Hayes electric heat treat furnace, type HG64, with controls, ser. No. 3496 .....$350.00

6" Avey Stock Cutting Band Saw, late model (exceptional machine)...$770.00

Conveyor approximately 100 feet in 8 and 10 feet lengths.....$3.50 per foot

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Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Blck.
Lathe, Turret 3-A W and S, S.P.D.
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Millers, Vertical No. 3 B and S and No. 4 Cin.
Profiler, No. 13 P and W, B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

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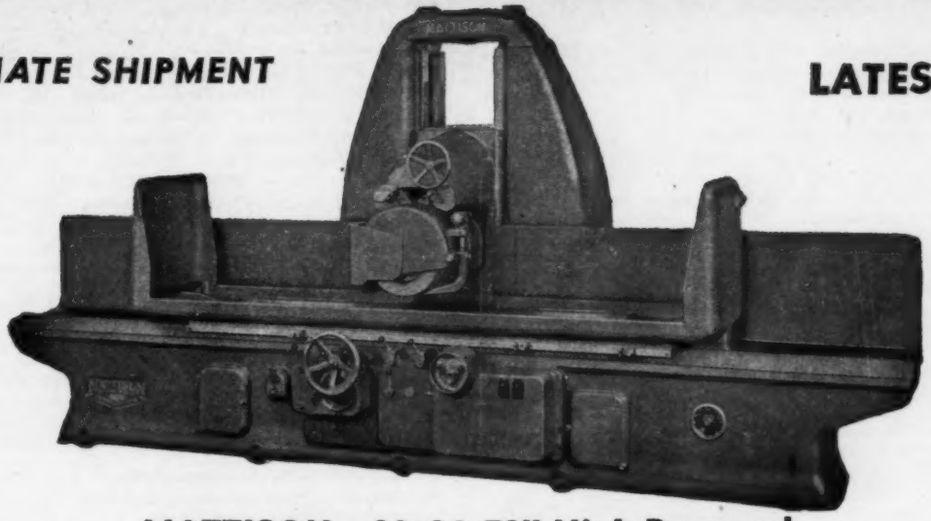

MATTISON—20x24x72" High Powered Precision Surface Grinder—Hydraulic

Equipped with guards, pumps, tank, piping, diamond holders. Arranged for motor drive with motors and electrical starting equipment.

BORING MILLS—Horizontal

DETRICK & HARVEY 4", 5" bar, Floor Type
GIDDINGS & LEWIS #25—2½" bar, Motor Drive
GIDDINGS & LEWIS #32—3¼" bar, latest type
LANDIS #25 3½" bar, Floor Type
NILES BEMENT POND 4¼" bar, Motor Drive
NILES BEMENT POND 5", 6", bar, floor type
UNIVERSAL 3" bar, latest type
UNIVERSAL 3A 3" Bar Motor Drive

BORING MILLS—Verfical

BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
Bullard 24", 36" Vertical Turret, New Era, Motor Drive
BULLARD 16"—6 spindle Mult-Au-Matic—Type D—Single indexing—Latest Type
KING 36" Vertical Turret, M.D., Latest Type
KING 42" 1 Swivel Head, 1 Turret Head, Motor Drive
NILES 84", 100", 120", 2 swivel heads, Power Rapid Traverse, Motor Drive

BROACHES

LaPOINTE 4L, Horiz., hyd., latest type
LaPOINTE #SRV-25-66, 10-54, Vertical Surface, hyd., latest type

GEAR CUTTING EQUIPMENT

BARBER & COLMAN #3 hobber, latest type
FELLOWS 61A, 61, 615A, 645A3, 7, 7A, 72, 75A, 77, High Speed Gear Shapers, latest type
FELLOWS 12M involute Measuring Instrument, Latest
FELLOWS 6Z2 Gear Shaper, High Speed, Latest Type
FELLOWS 13 LS Lapping, Latest Type
GOULD & EBERHARDT 36H, Hobber M.D.
GOULD & EBERHARDT 12HS Hobber, latest
GLEASON #7, Spiral, Bevel, Hypoid, Zerol, Latest
GLEASON 36" Straight Bevel Gear Planer, Motor Drive
GLEASON 3", 12" Straight Bevel Generator, Latest
PRATT & WHITNEY 10" Grinder, hyd., latest
PFAUTER No. 1, 2, with Differential, Motor Drive

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, latest type
LANDIS 6x18 Type "C", hyd., latest type
NORTON 16x72" Plain Type "C", latest type

GRINDERS—Surface

BLANCHARD #11—16" chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—motor drive
GALLMEYER & LIVINGSTON #35, 8x24" Hyd., latest
GALLMEYER & LIVINGSTON #55, 12x36" hyd., latest
HEALD #22, 12" chuck, Rotary, latest type
MATTISON 14x16x60 Hydraulic Latest Type
MATTISON 12x16x60 Hydraulic, latest type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type

JIG BORER

PRATT & WHITNEY 3B, Motor Drive, latest
REED PRENTICE #5, Die Sinker, Timken, Latest
VERNON Jig Borer Latest Type

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x14' centers, raised to swing 84", Power Rapid Traverse, Motor Drive
BRIDGEFORD 36"x28', 36"x32' bed—2 car., M.D.
JONES & LAMSON "Fay" 20x25" automatic, TIMKEN, latest type
LEBLOND 17"x5', 20"x10' bed, Rapid Production, Timken Bearing, latest type
LEHMAN 16x30" centers, hydratrol, TIMKEN, latest
LODGE & SHIPLEY 16/20"x30" centers, Timken bearing, latest type
LODGE & SHIPLEY 18"x72" centers, geared, M.D.
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, latest type
MONARCH 10x20" centers Model EE, Timken, latest
MONARCH 12"x30" centers, Timken, Latest type
NILES 42"x60", double head, motor drive
NILES 48x35' centers, Heavy Duty, 2 carriage, Timken Bearing, PRT, Latest Type
NILES 60x10', 35', centers, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 72"x62' centers, combination Boring and Turning, Motor Drive
NILES 30x50' Boring, Timken, Latest Type
REED PRENTICE 16x24" centers, geared, M.D.
SPRINGFIELD 14"x43" centers, geared, M.D.
SPRINGFIELD 16"x24" centers, geared, M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
SUNDSTRAND 8x15", stub, auto. TIMKEN, latest

LATHES—Turret

BARDONS & OLIVER #5, 7, universal, Timken, latest
CINCINNATI ACME No. 1, Latest Type
GISHOLT #3, 4, Univ., Timken, Latest Type
GISHOLT #1L, #2L Universal, Timken, Latest
JONES & LAMSON #3, 8A, Universal, Timken, Latest
LIBBY 1H-5, 5½ hole, Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken, latest
POTTER & JOHNSTON #5D2E, TIMKEN, latest
WARNER & SWASEY 3A, Universal 6" bar capacity, Timken Bearing, Latest Type
WARNER & SWASEY #5, Univ., Timken
WARNER & SWASEY #1A, 2A, Univ., Latest Type

MILLING MACHINES—Mfg.

CINCINNATI, 24", 48" duplex, TIMKEN, M.D.
CINCINNATI 3-24 Duplex Hydromatic, latest type
INGERSOLL 42"x38"x12' Planer Type, Adjustable Rail, A.C., Motor Drive
INGERSOLL 32"x36"x12' Combination Slab, Motor Drive
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
SUNDSTRAND Model 3A Duplex, Latest Type
TAYLOR & FENN M-80 Duplex, Spline, latest type

MILLING MACHINES—Plain

BROWN & SHARPE #12 Timken Bearing, latest
BROWN & SHARPE #2B, #3B, Timken Bearing
CINCINNATI 1-12, Timken, latest type
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI #4 Dial Type, Timken, latest type
CINCINNATI #3, 4 Timken Bearing, M.D.
CINCINNATI #3, 4S, 5—Motor Drive
CINCINNATI 08 Automatic rise and fall, Timken, Latest Type
KEARNEY & TRECKER #3 #4 heavy, TIMKEN, latest
KEARNEY & TRECKER 1218, Simplex, Timken bearing, latest type
KEMPSMITH #2, #4, Timken, latest type
SUNDSTRAND #2 Electro-Mil, Timken, Latest

MILLING MACHINES—Universal

AMES Bench, M.D., Latest Type
BROWN & SHARPE #3A, M.D.
CINCINNATI #3 Universal, Dial Type, Timken, Latest
HARDINGE Model UM, Timken, Latest
KEARNEY & TRECKER #3H, Timken Latest
VAN NORMAN #12, #22L, TIMKEN, Latest Type

MILLING MACHINES—Vertical

CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
CINCINNATI No. 3, No. 4 High-Powered, M.D.
GORTON 8D, Super Speed, with Duplicator, Latest
REED & PRENTICE 3VG with Hydraulic Duplicator Timken Bearing, latest type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84x84x18', 4 heads, DC, M.D.
GRAY 36"x36"x8', 2 heads, maximum duty, D.C., Motor Drive
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.

PRESSES

BIRDSBORO 325 ton, Vertical, Hyd., Latest Type
CLEARING Type DS-1125-32, Double Action, 125 ton, Latest Type
FERRACUTE DG-55, 75 ton, Drawing, Latest Type
GLEASON 15" Quenching, Motor Drive
NILES 200 ton, Horizontal Wheel, Motor Drive
WATSON STILLMAN, 20 ton, Hyd., strgt'g., Latest

MISCELLANEOUS

BARNES #172, 306H Vertical Hone, Latest
LANDIS 1" Bolt Threader—Latest Type
MORTON 60" traveling head, planer, miller and driller
MORTON 48" Draw Cut Shaper, Motor Drive
PRATT & WHITNEY "Keller" Type G, Type BL2416—Latest Type
JONES & LAMSON 6x15", 8x18" thread grinders, Latest type

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12"x36" NORTON—Universal—MultiPurpose—Type C—Hydraulic

No. 2 CINCINNATI—Tool and Cutter—Universal

No. 2 CINCINNATI—Centerless—"Filmatic"

LATHES AND TURRETS

12"x30" MONARCH—Model CKK—chuck—other equipt.

14"x30" REED PRENTICE—Model AA—Geared Head—8 speed

14"x30" LODGE and SHIPLEY—12 speed—220-440-3-60

14"x54" REED PRENTICE—Model AA—Geared Head—16 speed —550-3-60

20"x54" REED PRENTICE—Model AA—Geared Head—16 speed —220-3-60

No. 3 WARNER and SWASEY—Universal Turret—Chucking—2 speed mtr.—220-3-60

No. 2 BROWN and SHARPE—Hand Screw—Wire Feed

No. 2 BARDONS and OLIVER—Universal Turret—2 speed mtr.—220-3-60

MILLING MACHINES

No. 2 BROWN and SHARPE—Plain Horizontal—LIGHT TYPE—1943

No. 2K K and T "Milwaukee"—Plain Horizontal—1943

No. 3K K and T "Milwaukee"—Plain Horizontal—1943

No. 7B FRAY—Vertical Universal—220-3-60

No. 2H K and T "Milwaukee"—Vertical—1942

No. 3H K and T "Milwaukee"—Vertical—1942

No. 1 UNITED STATES—Hand—220-3-60—1942

SCREW MACHINES

No. OG BROWN and SHARPE—Fully Automatic—Vert. slide att.—Ser. No. 7500

No. OOG BROWN and SHARPE—Fully Automatic—MD Slot. Attach.—Ser. No. over 11,000

BORING MILL—Universal—3" bar—Horizontal—MD—220-3-60

BRAKE—Vulcan Power Press—8' capacity—Cast Iron

CLUTCH CUTTERS—Waltham

GEAR CUTTER—Henry J Reuson— No. 6.— 72" spur

DRILL—Avey—3' 9"—Sensitive—Radial—No. 2MT-BD

DRILL—Fosdick—3'—Square Column——Radial—BD

DRILL—Canedy Otto—Floor and Bench—No. 16—NEW

GRINDER—Norton—6"x32"—Plain Cylindrical—MD—220-3-60

GRINDER—Heald—No. 70A—Internal—MD—220-3-60

GRINDER—Heald—No. 60—Cylinder—SPD

GRINDER—Cam—Norton—10"x24"—Mtzd.

LATHE—Hendey—14"x6'—Geared Head—Factory MD

LATHE—Monarch—14"x8"—Engine—BG—Mtzd.

LATHE—Hendey—QCG—Yoke Head—Mtzd.

LATHE—Warner and Swasey—No. 2 Turret—PF to Turret—Arr. MD

MILLING ATTACHMENT—Fray—Vertical—Back Geared—220-3-60

MILLING MACHINE—Milwaukee—No. 2—Plain Horizontal—220-3-60

PLANER—Whitcomb—24"x24"x6'—Arr. for MD

PROFILER—Pratt and Whitney—No. 13—Gear Driven

SAW—Cochran Bly—No. 4B—Insert. Tooth blade—MD—220-3-60

PRESS—Standard—No. 3B—25-Ton—OBI—Roll feed—LIKE NEW

PRESS—Bliss—No. 22—OBI—50Ton

TUMBLING BARREL—Globe—16"x22"

SUPERFINISHER—Foster

SCREW MACHINE—Brown and Sharpe—No. 0—Fully Auto.—BD

SHAPER—American—28"—SPD—Back Geared

SHAPER—Gould and Eberhardt—24"—Crank—4 spd. drive

SHAPER—Stockbridge—16"—Crank—CD

SHAPER—Logan—7"—Floor Type—NEW

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36", 42" and 54" BULLARD Vert. M.D. Spiral Drive

No. 360-F GIDDINGS and LEWIS Floor Type, M.D.

No. 560-F GIDDINGS and LEWIS Floor Type, M.D.

No. 44 UNIVERSAL Tri-Way Table Type

GRINDERS

No 2 REID SURFACE, M.D.

12"x60" THOMPSON Type "C" Hyd. Surface

A3—16" ARTER Rotary Surface Grinder

No. 10 B and S, T and C, M.D.

No. 72A3 HEALD Plain and Sizematic. M.D.

No. 4T SELLERS Tool Grinder, M.D.

9" P and W Hyd. Gear, M.D.

No. 11 Blanchard Rotary, 16" Chuck

4—No. 4H LANDIS 4"x18" Plain Grinders with hyd. straight infeed, hyd. timer and hyd. footstock

6"x18" NORTON and LANDIS Type C Plain

6"x30" NORTON Type C Plain Cyl.

14"x36" LANDIS Type C Plain

24"x96" NORTON Plain, M.D.

TURRET LATHES

No. 0 B and S Wire Feed Screw Machine, M.D.

No. 2G MOREY Ram Type. M.D.

Nos. 3 and 4 GISHOLT Ram Type, Univ., M.D.

No. 3 J and L Ram Type Univ., M.D.

No. 4A W and S Saddle Type Univ., M.D.

MISCELLANEOUS

V-16 DOALL Contour Saw, M.D.

MILLING MACHINES

No. 5-60 CINCINNATI Duplex Hydro., tracer control mechanism for auto. rise and fall of spindle carriers

No .08 CINCINNATI Hor. and Vert.

No. 2-24 CINCINNATI Auto.

No 12-24 K and T Simplex, M.D.

No. 2G KEMPSMITH All Geared Univ. M.D.

No. 12 VAN NORMAN Universal Miller, M.D.

No. 2H K and T Vertical, Power Feed, M.D. (3)

No. 2MS CINCINNATI Dial Type, Plain M.D.

No. M-50A TAYLOR and FENN Vert. M.D.

No 12B P and W 2-spindle PROFILER

LATHES

AMES Precison Bench Lathe, 1" collet cap., M.D.

No. 820 LOGAN Lathe, M.D.

14"x30" cc. MONARCH Model C Toolroom, M.D.

14"x30" LEBLOND Heavy Duty, M.D.

15"x6' bed CARROLL and JAMEISON Geared Head, M.D.

16"x54" c.c. LEBLOND Heavy Duty, M.D.

16"x30" c.c. MONARCH MODEL "C" Toolroom, M.D.

16"x30" MONARCH MODEL "W" Engine, M.D. with KELLER CONTROLS

50"x17" centers LEBLOND "BIG SWING" Lathe, M. D.

DRILLS

No. 263 BARNES Heavy Duty Drill

6-spindle ALLEN 5 powerfeed spindles, belted M.D.

3'9" CINCINNATI BICKFORD 'Super Service" Radial

WIGGLESWORTH MACHINERY CO.

230 BENT STREET **Kirkland 7-5242** **CAMBRIDGE, MASS.**

REYNOLDS of Providence OFFERS:

16" x 72" Landis type "D" Plain Cylindrical Grinder. New 1944. Motors for 220/440-3-60 AC. Used 11 months. Excellent condition. Special Price $9,000.00

1½" Foote-Burt single spindle Automatic Screw Machine, motor drive, new in 1940. Very little use; like new. Bargain at $1,500.00

No. 12-M Morey 2-Spindle Profiler, 220/440-3-60, late model. Excellent condition. Price $1,250.00

No. 2-G Morey Hand Screw Machine. Like new. 220-3-60 AC, bar feed. Price $950.00

6" x 30" Norton plain cylindrical Grinder. 5 HP, 220-3-60 AC. Older type, but A-1. Price $400.00

REYNOLDS MACHINERY CO.

305 EDDY ST. PROVIDENCE 3, R. I.
JACKSON 8900

No. OOG B and S High Speed Automatics
No. 2 B and S High Speed Automatic
No. 13 B and S Grinder

MONA MEMBER

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N. Y.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED

MONA MEMBER

JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

EASTERN Rebuilt Machine Tools Tested To Manufacturers' Standard of Accuracy

VERTICAL MILLING MACHINES

No. 2M Cincinnati, m.d
No. 08 Cincinnati, m.d., latest
No. 2, 3, 4 Cincinnati High Speed Dial, m.d., latest
No. 2HL Milwaukee Swiveling Head m.d., latest
No. 2H Milwaukee Dial, m.d., latest
No. 2K Milwaukee Dial, m.d, latest
No. 2½B Milwaukee, m.d.
No. 3 Cincinnati High Speed Dial, m.d., latest
No. 3 Cincinnati High Speed Dial, m.d., with precision measuring equipment
No. 3B Milwaukee, m.d.
No. 3K Milwaukee Dial, m.d, latest
No. 3V Toledo, s. p. d.
No. 3V Van Norman, m.d., latest
No. 4 Cincinnati High Speed Dial, m.d., latest
No. 4 Cincinnati High Power, latest, m.d.,
No. 4 Kearney and Trecker' m.d.
No. 4H Milwaukee Dial, m.d., latest
No. 4K Milwaukee Dial, m.d., latest
No. 5 Brown and Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest
No. 6 Becker, cone
Cincinnati Hydromatic Vertical, with 2 vertical spindles on rail

MANUFACTURING TYPE MILLING MACHINES

No. 08 Cincinnati Model EA Plain Automatic, m.d., latest
No. 08 Cincinnati Model EA Plain Automatic, m.d., with rise and fall, latest
No. 00 Sundstrand Hydraulic Rigidmill, m.d., latest
No. 1-12 Cincinnati Plain Automatic, m.d., latest
No. 1-18 Cincinnati Plain Automatic, m.d., latest
No. 2-18 Cincinnati Plain Automatic, m.d., latest
No. 2-24 Cincinnati Plain Automatic, m.d., latest
No. 2-24 Cincinnati Plain Automatic, m.d., with rise and fall, latest
No. 3-24 Cincinnati Plain Hydromatic, m.d., latest
No. 3-36 Cincinnati Duplex Hydromatic, m.d.
M24 Milwaukee Simplex, m.d., latest
No. 33 Kempsmith Mfg., s. p. d.
No. 2 Sundstrand Electromill m.d. late
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d. latest, with tracer control
No. 56-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 56-90 Cincinnati Duplex Hydromatic, m.d., latest
No. 3A Sundstrand Copy Rigidmill, m.d.
Sundstrand Rigidmill, m.d., 18" rotary table
4" Pratt and Whitney Spline, m.d.
18" Cincinnati Mfg. Type, m.d.
18" Cincinnati Plain Automatic, m.d.
24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
48" Cincinnati Duplex Automatic, m.d.
Type P Oho Mfg., m.d.
24"x6' Ingersoll Slab, m.d.
30"x36"x12' Ingersoll Slab, m.d.
36"x24"x8' Ingersoll Slab, m.d.

UNIVERSAL MILLING MACHINES

No. 1 Cincinnati, cone, old
No. 3 Kempsmith, cone
No. 3A Heavy Brown and Sharpe, m.d.
No. 4A Brown and Sharpe, m.d.
No. 4 Cincinnati HP., m.d.
No. 4G LeBlond, s.p.d.

PLAIN MILLING MACHINES

No. 000 Brown and Sharpe, m.d., latest
No. 1A Milwaukee, m.d in base
No 1M Cincinnati, m.d.
No. 1½, 2 Cincinnati, cone
No. 2B Brown and Sharpe Dial Type, m.d. in base, latest
No. 2HL Milwaukee Dial, m.d. in base, latest
No. 2L Cincinnati, m.d in base, late
No 2 Cincinnati High Speed Dial, m.d. i base, latest (3)
No. 3S Cincinnati, m.d.
No. 3 LeBlond, cone
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 5B Heavy Brown and Sharpe, m.d.
No. 5 Cincinnati, m.d., rect overarm
No. 5 Heavy LeBlond, m.d.

THREAD MILLING MACHINES

No. CT-36 Lees-Bradner, m.d., latest
No. CT-54 Lees-Bradner, m.d., latest
Hall Planetary, m.d.
41/2x12", 6x14", 6x48", 6x80" Pratt and Whitney Thread, belted m.d.
6x20" Pratt and Whitney Type B, m.d. in base
10x24" Hansen-Whitney, m.d.

INTERNAL GRINDERS

No. 72A Heald Plain, m.d., late
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A5 Heald Plain, long bed type, latest, m.d.
No. 72A5 Heald Plain, late, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 73 Heald Airplane Cylinder, m.d., brand new
No. 74 Heald, m.d.
No. 172 Heald Gap, m.d., new
No. 6, 10, 20 Bryant, belt
No. 9 Cincinnati, belt
No. 16A—16" Bryant, m.d., late
No. 16—222" Bryant Hydraulic, m.d., late
No. 16RS Bryant Hydraulic, m.d., late
No. 24—21" Bryant Hydraulic, m.d., late
No. 49 Heald Single End Boorematic, m.d.
No. 70 Heald, belt

MANUFACTURING TYPE LATHES

No. 4 LeBlond Boring Lathe, 37' bed, 4" hole, very late
No. 9 Heavy LeBlond Multi-Cut, m.d.
3½x36", 3½x80", 4x60", 8x84" LeSwing, m.d.
8x132" LoSwing, m.d., late
9x12" Sundstrand, s.p.d.
11x18" centers LeBlond Rapid Production, m.d.
13x24" Coulter Automatic Threading, m.d.
13x24" LeBlond Rapid Production, m.d., latest
13x48" Coulter Automatic Threading, m.d.
13x96" Automatic Threading, belted m.d.
15"x6' Automatic Threading, belt
16"x6' Cincinnati Mfg., m.d. in base
16"x6' LeBlond Rapid Production, m.d.
17"x6' LeBlond Auto, Mfg., cone
20'x8' LeBlond Mfg., m.d.
20"x9' American Geared Head Mfg.
21"x8' LeBlond, cone
Niles-Bement-Pond Quartering Machine, m.d.
Schauer Type NA 2B Speed Lathe, m.d.

SHEET METAL MACHINERY

Gray Turret Head Metal Cutter, ¼" cap.
No. 2 Libert Nibbler, 28" throat
Southwark Rotary, ⅛" cap.
No. 1 Savage Nibbler, ¼" cap.
120" No. 100 Niagara Heavy Production Folder, 16 ga.

PLAIN CYLINDRICAL GRINDERS

No. 5—3x18" Brown and Sharpe, m.d., latest
No. 10 Brown and Sharpe, m.d.
No. 11 Brown and Sharpe, m.d.
6x18" Cincinnati Plain Hydraulic, m.d.
6x18" Landis Self-Contained, m.d.
6x30" Cincinnati Hydraulic model EA, m.d.
6x32" Fitchburg Type A, m.d., latest
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinati Saddle Type, m.d.
10x24" Landis Self-Contained, m.d.
10x36" Cincinnati Hydraulic Model EA, m.d.
10x48" Brown and Sharpe, belt
10x72" Brown and Sharpe, belt
10x72" Landis Self-Contained, m.d.
12x36" Landis, m.d.
12x48" Cincinnati Self-Contained, m.d.
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Self-Contained, m.d.
14x48" Cincinnati Self-Contained, m.d.
14x52" Norton, belted m.d.
14x72" Cincinnati Self-Contained, m.d.
20x120" Landis Self-Contained, m.d.
26x96" Landis Self-Contained, m.d.

UNIVERSAL CYLINDRICAL GRINDERS

No. 1 Brown and Sharpe, m.d., latest
No. 2 Brown and Sharpe, belt
12x24" Cincinnati Self-Contained, m.d., Filmatic Spindle
12x30" Landis, m.d., late
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati Hydraulic, m.d., latest
12x48" Cincinnati, m.d.
12x48" Norton, m.d., latest
16x48" Cincinnati, belted m.d.
18x48" Cincinnati Hydraulic, m.d., latest

SURFACE GRINDERS

No. 10 Blanchard, m.d., 16" chuck
No. 11 Blanchard, m.d., 16" chuck, latest
No. 16—26" Blanchard, m.d., 26" chuck
No. 16—30" Blanchard, m.d.
No. 22—12" Heald, m.d.
No. 25A—16" Heald, m.d., latest
No. 25A—24" Heald, m.d., latest
No. 26—16" Heald, belt
No. 33 Abrasive Vertical, m.d.
10x12x60" Norton Hydraulic, m.d., late
14" Pratt and Whitney Vertical, m.d.
18x72" Thompson Type C Hydraulic, m.d., late
22" Pratt and Whitney Vertical Type B, m.d.
54" Bridgeport Knife, belt

SAWS

6x6" Pearless, m.d., gear box
6x6" Racine, s.p.d.
13x13" Peerless Universal Shaping, m.d.
7½ H.P. Cincinnati Elec. Tool Co. type JCAW Abrasive-Cut-off Machine
No. 3 Nutter and Barnes Cold
No. 6 Cochran-Bly Cold
No. 8 Nutter and Barnes Cold
Gustav Wagner Cold, m.d., 28" blade
No. 138 Espen-Lucas Cold, m.d.

MISCELLANEOUS

40" Chip Wringer Tolhurst, m.d.
BL2420 Pratt and Whitney Keller, m.d., very late
Gisholt Precision Balancing Machine, m.d.
No. 2 Cochran-Bly Filing Machine, m.d.
No. 11 Cochran-Bly Saw Sharpener, belt
No. 11-S Cochran-Bly Saw Sharpener, m.d.
Detrick and Harvey 2 spindle Profiler, belt
No. 12M Morey 2 spindle Profiler, m.d.
No. 12 Pratt and Whitney 2 spindle Profiler, belt
Wagner Saw Sharpener, m.d.

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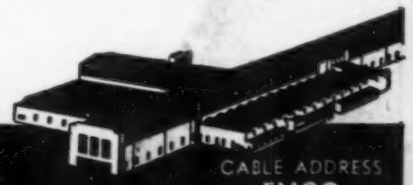

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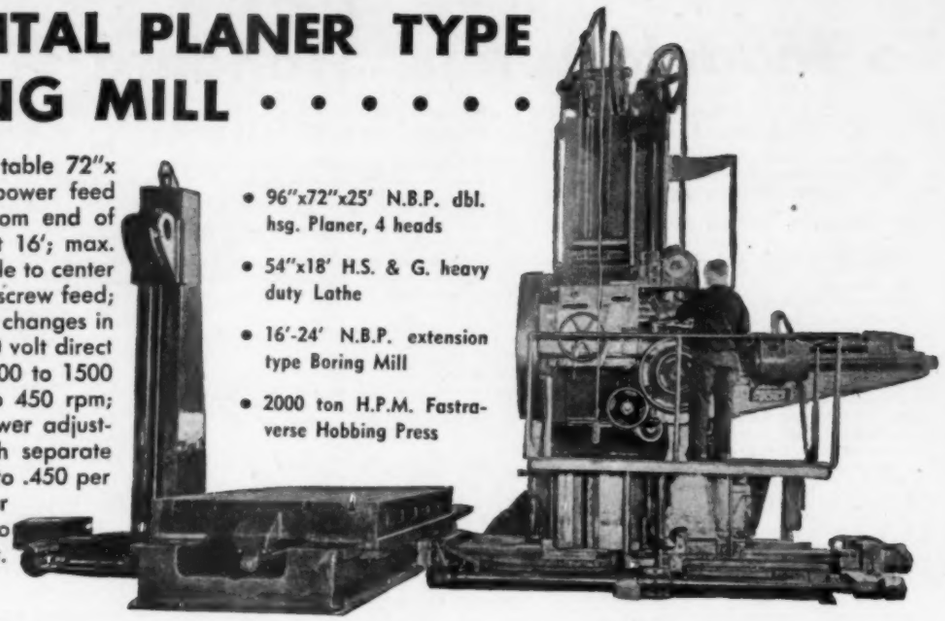
CABLE ADDRESS EMCO

EMERMAN offers from STOCK

7" DETRICK & HARVEY

HORIZONTAL PLANER TYPE BORING MILL . . . . . .

● Working surface of table 72"x 144"; Travel of table power feed 10'2"; max. distance from end of spindle to outer support 16'; max. distance from top of table to center of spindle 8'2"; Bar has screw feed; has 4 mechanical speed changes in gearbox and 35 HP, 220 volt direct variable speed motor, 500 to 1500 rpm; spindle speed 1 to 450 rpm; outer support has 5' power adjustment on outer way with separate motor; feed range .010 to .450 per rev of spindle; with power feed in all directions to table and head on upright.



- 96"x72"x25' N.B.P. dbl. hsg. Planer, 4 heads
- 54"x18' H.S. & G. heavy duty Lathe
- 16'-24' N.B.P. extension type Boring Mill
- 2000 ton H.P.M. Fastraverse Hobbing Press

EMERMAN MACHINERY CORP.

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.
Drills—Large selection, single and multiple spindles also bench types, many of them new.
Gear Cutters—Brown & Sharpe No. 3—26", Gould & Eberhardt 42".
Grinders—Cylinder B & S No. 11, Planer type 16"x36", Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.
Lathes—14"x6' 8', 10'—16"x6', 8', 10'—18"..6', 8' 10'—20"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 19" and 18" bench and floor type.
Planers—Single head 24"x6', 24"x8', 26"x8'.
Shapers—16", 20", 24", B.G. crank.
Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".
SPECIAL—New totally enclosed dust ,proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.
WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. .What we have today may be sold tomorrow, so a list is really not dependable.
Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel, motor attached.
PATTERN MAKING MACHINERY—42"x 16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting able also tiling arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

LATHES

36"x25' centers Niles-Bement-Pond, two carriages
36"x12'-5" centers Lodge & Shipley GH
25"x12'-1" centers LeBlond GH

Also

3" Universal Horizontal Boring Mill
24" Bullard NEW ERA Vertical Turret Lathe
No. 75½ Bliss SS Power Press, 125-tons

Older Machines, but in good condition

HAZARD BROWNELL
350 Waterman St., Providence 6, R. I.

STOCK TOOLS—Prompt Shipment

BORING MILL, Vert. 36" Bullard or King
BORING MILL, Vert. 72" Betts, 2 Hds.
BROACH, XA Oilgear, Hor., 60" Str.
DRILL Mult. Hyd. No. 15HC Fox, 24 spdl.
GEAR SHAPER, No. 75 Fellows, 6½" hel.
GRINDER, Int. No. 72-A5 Heald Hydraulic
GRINDERS, Plain, Hyd., 14"x36" Norton
GRINDER, Surf. Nos. 3 and 5 Abrasive
GRINDER, Surf. Rotary No. 25 Heald
HAMMER, Pneumatic, No 6-B Nazel
LATHES (3) 18"x10' L&S, 12 Speed Grd. Hd.
LATHE, 24"x16' Boye & Emmes, Grd. Hd.
LATHE, 38"x19' Putnam, Q.C.G.; T.A., Grd. Hd.
MILLERS, Pl. No. 2M, 3, 3S, 4 and 5 Cincinnati
MILLERS, Univ. No. 4 Cincinnati, Vert. Att.
MILLER, Vert. No. 40H Index, 8"x22", m.d.
PLANER, Openside, 48"x48"x12' Cleveland
PLANER, Openside, 108"x96"x24' D & H.
PLANER, Hydraulic, 48"x48"x14' Rockford, 4 hds.
PLANER, 72"x72"x12' N-B-P, 4 hds., m.d.
PLANER, 128"x96"x30' Simmons, 4 hds., m.d.
SHAVERS, 16", 24" and 32", M.D.

PARTIAL LIST

LANG MACHINERY COMPANY
28th St. & A.V.R.R, Pittsburgh, Pa.

National Bent Shank Nut Tappers —Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42"x42"x36 ft. 4 Head Planer
Cincinnati 36"x36"x16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
128–138 Mott St., New York 13, N. Y.

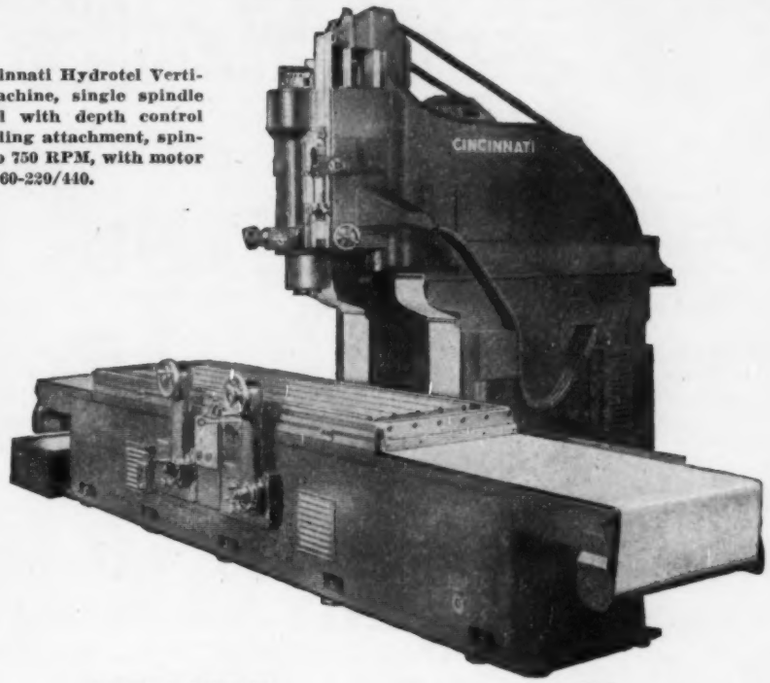
HYPRO PLANERS

2—36" x 36" x 14' CINCINNATI, 2 heads, dial feeds, rapid traverse, pressure lubrication, direct connected reversing motor drive.

EXCELLENT CONDITION

THE O'BRIEN MACHINERY CO.
113 N. 3rd St. Philadelphia, Pa.

QUALITY *Machine Tools* NOW IN STOCK



28 x 60" Cincinnati Hydrotel Vertical Milling Machine, single spindle selective model with depth control and 360° profiling attachment, spindle speeds 30 to 750 RPM, with motor and controls 3-60-220/440.

AUTOMATICS

2G Brown & Sharpe, H.S. 1½" capacity. New in 1943.
9/16" RA-6 Acme-Gridley. New in 1943.
1⅝" Conomatic 8-spindle. New in 1942.
6" 4 spindle Conomatic Bar Machine.
3¼" RA6 Acme Gridley.
16" x 33" Fay Automatic Lathe. 1941.
★Bullard Multaumatic, six spindle model D, single index. Late model.

BORING MILL

★ Universal Horizontal, 4" bar, table type, with facing head, rotary table, boring bars, motor and control. New in 1943.

BROACHES

No. 2SL LaPointe Hydraulic Horizontal. New in 1942.
No. CPC 6-30 LaPointe Hydraulic Vertical. New in 1941.
No. CPC 6-36 LaPointe Hydraulic Vertical. New in 1943.

DRILLS

4' Dreses Radial, 11" column.
6' American radial, 17" column.
No. H3 Barnes Hydram, 8 speed. 1942.
42" Cincinnati-Bickford, single spindle.
No. 201 Barnes Geared Drill. New in 1943.
No. 3 Avey, three spindle, heavy duty.
KH 2 Allen Sensitive Drill, 4 or 6 spindle. New in 1943.
No. 3 Baush Multiple Spindle.
Barnes Horizontal Deep Hole, 2 spindle.
Taft Peirce Horizontal, double end.

GEAR CUTTERS

No. 6 Gleason Gear Tester.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, 645A3 Fellows Gear Shapers.
No. 12 Barber Colman Hobber.

GRINDERS

No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle. 1941.
14" x 48" Cincinnati Universal, Filmatic bearing, internal spindle. New in 1942.
No. 3 Brown & Sharpe Universal. New in 1943.
10" x 72" Norton Cylindrical.
10" x 36" Landis Hydraulic. New in 1943.
No. 22 Heald Rotary Surface Grinder. New in 1943.
No. 18 Blanchard, 30" chuck. 1942.
30" x 24" x 192" Mattison Hydraulic Surface Grinder. New in 1943.
14" x 16" x 60" Mattison Surface.
3B Abrasive, with chuck. New in 1943.
6" x 12" x 18" Thompson Surface Grinder. New in 1942.
No. 16CP16 Bryant Hydraulic Internal Grinder. New in 1942.
No. 75A Heald Internal. New in 1943.
No. 72A3 & 72A5 Heald Sizematic. 1943.
★ No. 74 Heald Internal Grinder, with 6 foot extension on bed for long work, adjustable work headstock on swivel table for long tapers.

LATHES, ENGINE

Hendey 12" x 30", g.h.
Reed Prentice 14" x 30" g.h.
Lodge & Shipley Tool Room, 14" x 54", rel. att. New in 1943.
Reed Prentice 14" x 78" Toolroom. 1943.
American Pacemaker, 16" x 30". 1942.
Reed Prentice 16" x 54". New in 1943.
Sidney 18" x 54". New in 1943.
Lodge & Shipley 20" x 48". New in 1943.
Monarch, 24" x 36", g.h.
★ Bertram 28" x 240" "Timesaver", two carriages, with rapid traverse. Canadian made from Niles patterns. 1942.
American 36" x 12' between centers.
Lodge & Shipley 48" x 54", cone driven.
Carroll Jamieson 18" x 5', C.D.
South Bend 14½" x 6'. New in 1944.
IMP Model Lo-Swing.
Lipe Carbomatic, 15" x 30".
LeBlonde Production, 17" x 30".

LATHES, TURRET

Warner & Swasey No. 4A, with chuck, 7½" hole.
Warner & Swasey No. 2A, preselector. New in 1943.
Gisholt No. 2L, cross sliding turret. 1943.
Gisholt No. 1L, hydraulic speed selector. New in 1943.
No. 1S Acme Universal, saddle type.
Gisholt No. 5 Universal, Hydraulic speed selector. New in 1944.
Foster No. 5 Universal, Bar feed. 1943.
Warner & Swasey No. 4 Universal, preselector. New in 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal, two speed. New in 1942.
Bardons & Oliver No. 3 Universal, motor in base. New in 1941.
Warner & Swasey No. 2, oversize. 1942.
Bardons & Oliver No. 4, bar feed. 1941.
★ Bullard New Era VTL, 36" and 42".

MILLS

★ Cincinnati No. 4 Universal, High Speed Dial Type with rotary table, vertical attachment, slotting attachment, dividing head, motor and control. New in 1942.
Cincinnati No. 2MH Universal. 1942.
Milwaukee No. 2H Universal. 1944.
Van Norman No. 2SU Universal.
Brown & Sharpe No. 3B Plain. 1943.
Brown & Sharpe No. 2B Plain.
Cincinnati No. 2MH Plain, latest model.
Milwaukee No. 2HL Plain with vert. att. New in 1943.
Milwaukee No. 3H Vertical, latest model.
Milwaukee No. 2K Vertical. New in 1942.
Cincinnati No. 08 and 2-18 Rise and Fall.
Cincinnati No. 1-12 Automatic.
Cincinnati No. 3-36 & 4-36 Hydromatic.
DeVlieg Supermill No. 31B.
Whitney Hand Mill, No. 6.

MISCELLANEOUS

Buffalo No. ½ Universal Ironworker.
Racine 10 x 10 Hydraulic Saw.
Bertsch 6' x ½" Bending Roll.
No. 26F Norton Hydrolap.
No. 5B Standard OBI Press. New.
No. 8-6 Zeh & Hahneman S.S. Geared Press.
Pratt & Whitney Profiler, No. 12B.
Tapper, Leland Gifford 3' Radial, No. 3 MT. New in 1941.
24" Cincinnati Worm Feed Rotary Table.
Dodds Dovetail Machine, 15 spindle.

PLANERS AND SHAPERS

Cincinnati Planer, 42" x 42" x 20', D. C.
12" Vernon Shaper. New in 1941.
Gould & Eberhardt 16" Shaper, M. D.
Cincinnati 20" Shaper, Universal table. New in 1943.
Cincinnati 24" Shaper. New in 1943.
Smith & Mills 28" Shaper. New in 1942.
Cochrane & Bly No. 14 Vertical Shaper. New in 1942.
Pratt & Whitney 6" Vertical Shaper. New in 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

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High Quality NEW, USED & REBUILT Machine Tools
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MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

SPOT DELIVERY

BORING MILL—Betts 112" 2 heads (1943)
Bliss Horizontal 8" (1943)

BRAKES—New Barth Hand 8' x 16 G
New Lynn Hydraulic 56" x 14 G
New Columbia 10' x 3/16"
D & K 8' x 16 G Apron Power

SHEARS—New Foot 36" to 96"
New Barth Power 52" to 72" x 14 G
Pexto Power 30" & 60" x 16 G
New Columbia 10' x 3/16"
Pelz Eye Beam Shear No. T-36 (5-15")
Morgan 100" x ¾"
Cincinnati 10' x ½"

AUTOMATICS—(8) New Britain Gridley Model No. 86 Chuckers (1942)

MILLER—Bridgeport Vertical, Collets

SAWS—DoAll Contour 16"
Newton Cold Cut 32" x 10" diam.

WELDERS—New Sterling up to 50 KVA

LATHE—Engine 72" x 75'
Pattern Makers 18" x 12'

PRESSES—New Famco Power Presses 4½ & 7½ ton
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POWER PRESSES 50 Miscellaneous Presses up to 30 Ton

MAKE	TONS	STROKE	DIE SPACE	TYPE
(2) Bliss No. 58 (1943)	20	5"	12½" x 13½"	3 hp motor 3-60-220 & pinwheel feeder & hopper
(4) Ferracute C22 Duplex 2 Presses on 1 stand (1943)	20	5½"	13½" x 14"	(Two 3 HP Motors, 3-60-220—440 plus (two ¼ HP Motors
Bliss No. 21	35	3"	18" x 27"	O. B. I.
Torrington	50	2" & 1"	23" x 16"	(Sub-Arch Press, (Dble Action Cam
Toledo No. 54	60	3"	18" x 18"	SS with side shear
(2) Bliss No. 6	125	5" & 2"	24" x 32"	(SS Dble or Single (Action, b. g.
Bliss No. 3¾B Toggle	150	10½" Draw	30" x 29"	Toggle, b. g.
Bliss No. 7	180	5" & 2"	28" x 36"	SS Dble or Sngl Action; any stroke up to 5" b. g.
(2) Clearing (F1200-42)	200	26" & 30"	38" x 44"	SS Single Action, b.g.
(2) Verson	250	1¼" & 2½"	36" x 36"	(SS Forging, no (Clutches, fast
(2) Bliss No. 77½ (308)	250	12" & 14"	30" x 29"	SS Single Action, b.g.
(3) Bliss No. 78½ (310)	450	18"	52" x 36"	SS Single Action, b.g.
Toledo No. 60¼	1200	23½"	59" x 50"	SS Single Action, b.g.
Birdsboro Hyd.	1300	21"	87" x 29"	SS Hydraulic

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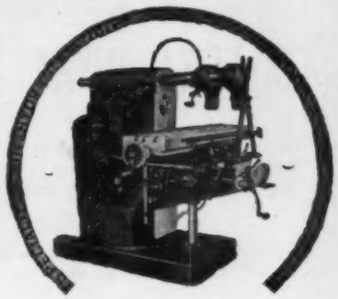

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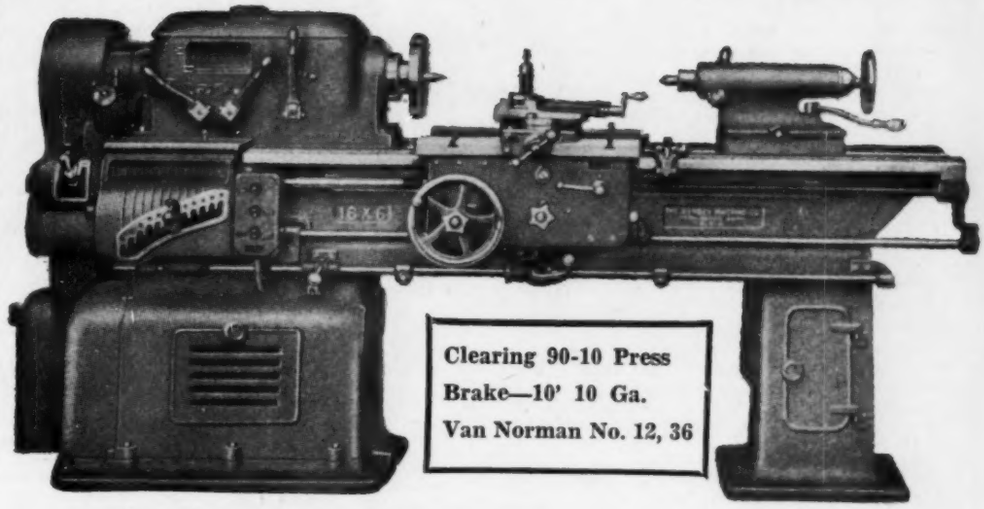

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Niles-Bement-Pond 4" duplex. Universal 3"
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Gisholt No. 1L, 2L Univ. M.D., Late
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J. & L. 2¼"x24", 3¼"x36"
Acme #2 M.D.
Oster 601 Rapiduction, Late
Hardinge ESM, 2nd operation, late

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Norton 50"x28' M.D. Roll Grinder
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10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
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Cleveland Vert. No. 1 M.D.; #1 Univ.
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No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
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B. & S. No. 1, 3 Vert.
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Automatic, 2⅝" Acme Gridley 6 spindle, model RA6 with accelerated reaming in 4th & 5th positions and quite a little equipment. Serial No. 84243. New 1941.

Automatic, 1⅝" New Britain 6 spindle, model 61 with several sets of collets and tooling. New 1942 or 1943.

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Automatic, 16" x 33" Fay, serial No. 82797, new in 1943. Has hydraulic chuck, front and rear tool slides and hydraulic tailstock.

Air Compressor, 1118 cu. ft., 20" & 12" x 16" Worthington "Feather Valve" duplex 2 stage, serial No. 24189. Has 195 HP General Electric 440/60/3 synchronous motor directly on shaft.

Boring Mill, 100" Niles-Bement-Pond Heavy Pattern. Two swivel heads with power rapid traverse. 35 HP, 230 volt direct current variable speed motor. Serial No. 17552.

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Grinders, 6"x18", 10"x18", 14"x36", 16x36" & 20"x48" Landis type C hydraulic. New from 1941 to 1943.

Thread Grinder, No. 33 Excello automatic, serial No. 4459, new in 1942. Also have No. 35 Excello, universal type and about same age.

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Lathe, Turret, No. 1L Gisholt saddle type universal, serial No. 27-627, new in 1942. Has air chuck, some tooling. Also have Nos. 3, 4, 5 & 3AL Gisholt.

Lathe, Turret, 36" Bullard "Spiral Geared" vertical, serial No. 19262, new in 1942. Has 3 jaw chuck table, cutting lubricant system.

Miller, Thread, Model CT-36 Lees Bradner, serial No. CT141, new in 1942. Has 13" hole through spindle.

Miller, No. 28-60 Cincinnati Hydrotel vertical, single spindle with down feed and hand controls. Serial No. 1H1V1L-313, new in 1942.

Millers, Cincinnati Hydromatic, most manufactured 1942 or later. Sizes: 3-24, 4-36, 4-48, 5-48, 56-72 and 56-90.

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Ohio 24"x24"x6' Planer, single head on cross rail.

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B. and S. No. 2B Hor. Miller, long. feed 28", cross 10", vert. 18⅛", tbl. wkg. surf. 51¾"x11 11/16"; spdle speeds 30-1200 RPM, late type.

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48"x48"x18' Detrick and Harvey Heavy, 4 heads, 230 V DC
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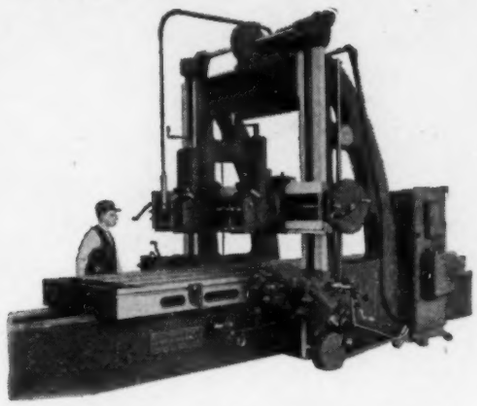

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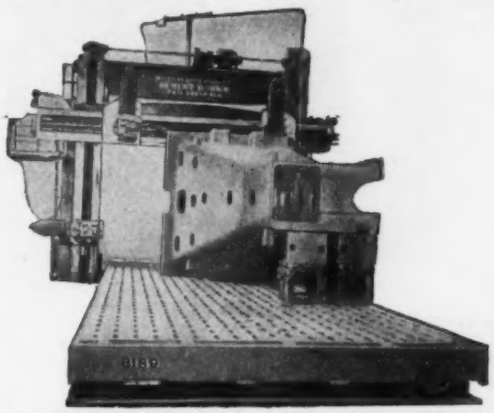

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12" 8 spdl. Bullards, late type, lots of tooling.

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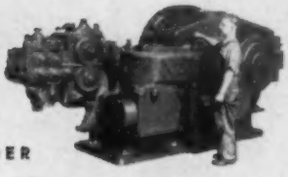

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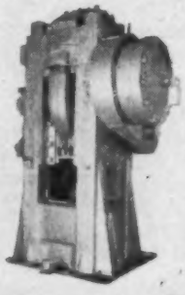

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INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives.....18-19, 22-23, 42-43, 74, 177, 183, 210, 223, 260, 262, 268

Accessories & Attachments (Machine Tool).....174, 316

Arbors & Mandrels 274

Bearings.....4th Cover, 16, 239, 267, 289, 290, 297

Bending Machines 186

Books, Technical 182, 282, 296

Boring, Drilling & Milling Machines (Horizontal).....2nd Cover, 8-9, 167, 226, 227, 290

Boring Machines Internal 290

Boring & Turning Machines (Vertical) 47, 71, 290, 316

Broaching Machines 56, 231, 237

Castings 164

Centers 238

Chucks.....216, 229, 230, 250, 266, 274, 275, 282, 290

Cleaning & Drying Machines & Supplies 186, 256

Coolant Systems, Filters & Supplies 266, 296

Cut-Off Machines; Sawing Machines.....192, 214, 219, 258, 262

Dressers, Grinding Wheel 278

Drilling Machines.....59, 66, 75, 142, 153, 163, 168, 184, 207, 252, 258, 278, 286, 290

Engineering & Production Services 232, 243

Fasteners.....32, 165, 209, 255, 274, 278, 288, 290, 291, 296

Finishing Machines 234

Gages & Instruments.....30-31, 34, 54, 149, 236, 254, 258, 260, 262, 272, 294

Gear Cutting Machines.....3, 6-7, 51, 65, 224, 241, 248

Gears, Speed Reducers, Motor Reducers.....28, 192, 240, 241, 242

Grinders—Cutter & Tool.....159, 170, 244, 265, 287

Grinding Machines—Production.....12-13, 18-19, 33-34, 44, 72, 205, 228, 273, 277, 298

Heads: Drilling, Grinding & Tapping 286

Heat Treating Equipment & Supplies..286

Jig Borers.....52, 63, 181, 294

Lathes, Automatic.....45, 50, 58, 149

Lathes, Engine.....3rd Cover, 21, 70, 149, 155, 173, 208, 281, 286, 287, 292

Lathes, Turret.....45, 50, 55, 58, 69, 149, 318

Lubricants, Cutting Fluids, Quenching Oils, Rust Preventives.....29, 80, 161, 203, 217, 218, 220, 222, 234, 238, 263, 264, 270, 282

Lubricating Systems & Equipment....161, 283

Marking Machines & Tools.....174

Materials, Cutting & Forming.....64, 144, 169, 184, 213

Materials of Manufacture.....38-39, 24-25, 151, 164, 196, 198-199, 261, 267, 271, 295

Materials Handling Equipment....187, 190

Millers, Die Sinkers, Profilers.....4, 8-9, 14-15, 17, 26-27, 52, 249, 290, 294, 316

Parts & Equipment, Electrical.....48-49, 61, 175, 179, 185, 195, 197, 235, 253

Parts & Equipment, Hydraulic & Pneumatic.....193, 233, 247, 251, 270, 284

Parts & Equipment, Mechanical.....252

Photographic Service, Materials.....294

Planers 17, 60

Polishing & Buffing Machines.....234

Power Transmission 279, 293

Presses, Forging & Forming Equipment & Supplies.....53, 62, 63, 67, 76, 157, 180, 200-201, 204-205, 232, 236, 237, 254, 256, 259, 260, 269, 270, 278, 286, 294, 312, 314

Riveting Machines 260

Safety Equipment 172, 176, 276

Screw Machines; Chucking Machines 57, 146, 171, 192, 274

Shapers, Slotters, Keyseaters..63, 82, 286

Special Machine Tools.....163, 256

Steel Blue 282

Stitchers; Metal 285

Tapping Machines 163, 221, 286

Threading Machines 10-11, 225

Tooling Set-Up Equipment.....182, 245, 254, 260

Tools, Cutting.....35, 36-37, 51, 65, 66A-66B, 68, 73, 139, 166, 169, 178, 180, 189, 191, 192, 206, 211, 212, 213, 215, 225, 231, 232, 234, 240, 241, 244, 246, 254, 260

Tools, Hand 46, 257, 258, 288

Tools, Portable 214, 266

Transportation 250

Welding & Cutting, Brazing & Soldering Equipment & Supplies 40-41, 246, 248, 280

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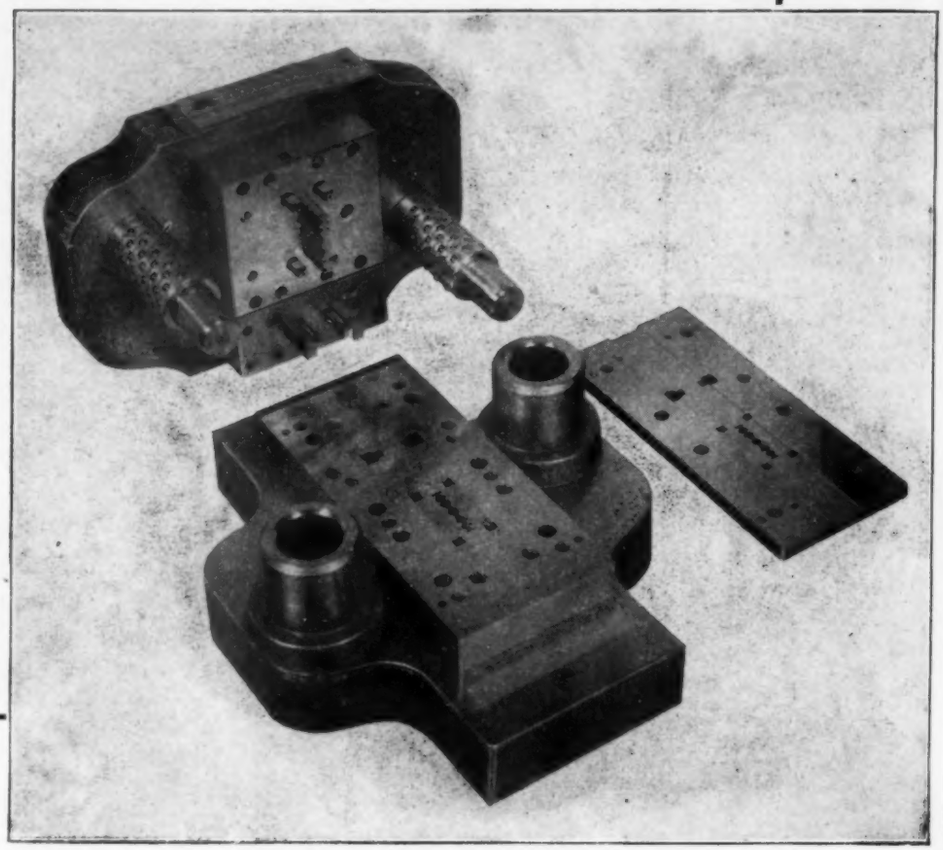

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ADVERTISERS INDEX

	Page
Acme Steel Co.	285
Adams Co.	28
Air Reduction	280
Allegheny Ludlum Steel Corp.	196
Allen Manufacturing Co.	278
Allied Products Corp.	243
Allis-Chalmers Mfg. Co.	61
Almond Mfg. Co., T. R.	290
Amelotte, N. R.	258
American Broach & Machine Co.	56
American Optical Co.	276
American Rolling Mill Co.	144
American Screw Co.	288
American Steel & Wire Co.	24, 25
American Steel Foundries Division King Machine Tool	47
American Swiss File & Tool Co.	232
American Tool Works Co.	21
Ames Co., B. C.	272
Armstrong-Blum Mfg. Co.	68
Armstrong Brothers Tool Co.	46
Atlantic Gear Works	241
Auto Engine Works Inc.	242
Avey Drilling Machine Co.	278
Axelson Manufacturing Co.	173
Baker Bros., Inc.	226
Baldwin Southwark Div., Baldwin Locomotive Works	200, 201
Ball & Roller Bearing Co.	290
Barber Colman Co.	51, 65
Bath & Co., John	215
Baumbach Mfg. Co., E. A.	286
Bay State Abrasive Products Co.	223
Behr-Manning Corp.	268
Bellows Co.	193
Bethlehem Steel Co.	64
Black & Decker Mfg. Co.	214
Black Drill Co.	246
Blanchard Machine Co.	20
Bodine Corp.	227
Braun Gear Co.	241
Brown & Sharpe Mfg. Co.	26, 27
Bryant Chucking Grinder Co.	33, 34
Bryant Machinery & Engrg. Co.	59
Buffalo Bolt Co.	165
Bullard Co.	50
Bunting Brass & Bronze Co.	267
Carboloy Co., Inc.	278
Carborundum Co.	22, 23
Carlton Machine Tool Co.	258
Carpenter Steel Co.	38, 39
Carroll & Jamieson Machine Tool Co.	286
Central Screw Co.	288
Century Electric Co.	185
Chambersburg Engineering Co.	269
Chase Brass & Copper Co., Inc.	271
Cimcool Div., Cincinnati Milling Machine Co.	29
Cincinnati Bickford Tool Co.	75
Cincinnati Gear Co.	240
Cincinnati Gilbert Mach. Tool Co.	278
Cincinnati Grinders Incorporated	5
Cincinnati Milling Machine Co.	4
Cincinnati Planer Co.	60
Cincinnati Shaper Co.	82
Clark Co., Hobart H.	254
Clearing Machine Corp.	259
Cleereman Machine Tool Co.	59
Clemson Brothers, Inc.	234
Cleveland Crane & Engrg. Co.	157
Cleveland Form Tool Co.	314
Cleveland Punch & Shear Wks. Co.	62
Columbia Machinery & Engrg. Corp.	219
Columbia Steel Co.	24, 25
Columbus Die Tool & Machine Co.	256
Comtor Co.	260
Cone Automatic Machine Co.	57
Consolidated Machine Tool Corp.	71
Continental Screw Co.	288
Corbin Screw Div., American Hdwe. Corp.	288
Cosa Corporation	181
Covel Manuacturing Co.	265
Covert Manufacturing Co.	53
Cratex Mfg. Co.	260
Cross Co.	163
Cullen-Friestedt Co.	248
Curtis Universal Joint Co.	252
Cushman Chuck Co.	275
Danly Machine Specialties Inc.	76
Davis & Thompson Co.	252
Davis Keyseater Co.	286
Dayton Rogers Mfg. Co.	232
Defiance Machine Works, Inc.	245
DeSanno Co., A. P.	177
Detroit Bevel Gear Co.	240
Detroit Reamer & Tool Co.	170
Detroit Tap & Tool Co.	159
DeVlieg Machine Co.	52
Dow Chemical Co.	172
duMont Corp.	192
DuPont de Nemours & Co., Inc., Electrochemicals Dept.	218
Dykem Co.	282
Earle Gear & Machine Co.	241
Eastern Machine Screw Corp.	240
Elco Tool & Screw Corp.	288
Electric Storage Battery Co.	175
Electro Arc Mfg. Co.	235
Errington Mechanical Laboratory	282
Etna Machine Co.	262
Federal Products Corp.	30, 31
Fellows Gear Shaper Co.	6, 7
Firth-Sterling Steel Carbide Corp.	169
Fiske Bros. Refining Co.	234
Fitchburg Grinding Machine Corp.	273
Foote-Burt Co.	142
Ford Motor Co., Johanson Div.	254
Fosdick Machine Tool Co.	66
Gallmeyer & Livingston Co.	277
Ganschow Gear Co.	242
Gardner Machine Co.	44
Garrison Machine Works Inc.	250
Gates Rubber Co.	279
Gear Grinding Machine Co.	224
General Electric Co. Apparatus Dept.	40, 41, 48, 49
Geometric Tool Co.	66B
Gisholt Machine Co.	58, 318
Gleason Works	3
Gorham Tool Co.	206
Gorton Machine Co., George	249
Goss & deLeeuw Machine Co.	274
Grant Gear Works	241
Grant Mfg. & Machine Co.	260
Gray Co., G. A.	17
Greenfield Tap & Die Corp.	66A
Greenlee Bros. & Co.	171
Hannifin Corporation	256
Hansen Manufacturing Co.	247
Hanson Whitney Machine Co.	225
Hardinge Brothers, Inc.	281
Harper Co., H. M.	288
Harrison Radiator Div., Gen. Motors Corp.	283
Hartford Special Machinery Co.	240
Heald Machine Co.	2nd Cover
Hendey Machine Co.	70
Henry & Wright Mfg. Co.	236
Hill Acme Co.	72
Hones, Inc., Charles A.	286
Houghton & Co., E. F.	202, 203
Hoyland Steel Co., Inc.	184
Hyatt Bearings Div., General Motors Corp.	289
Hyster Co.	187
Ideal Industries, Inc.	238
Ingersoll-Rand Co.	257
J & S Tool Co.	244
Jacobs Manufacturing Co.	229, 230
Jones & Lamson Machine Co.	45
Jones & Laughlin Steel Corp.	151
Kalamazoo Tank & Silo Co., Machine Tool Div.	194
Kelley Gear & Tool Co.	240
Kester Solder Co.	246
Knight Machinery Co., W. B.	316
L. W. Chuck Co.	274
Lake Erie Engineering Corp.	204, 205
Lamson & Sessions Co.	288
Landis Machine Co.	10, 11
Landis Tool Co.	12, 13
Langelier Mfg. Co.	286
LaPointe Machine Tool Co.	231
Lebanon Steel Foundry	164
LeBlond Machine Tool Co., R. K.	3rd Cover
Leland-Gifford Co.	153
Lemco Products Inc.	294
Link Belt Co.	16
Linley Brothers Co.	294
Littell Machine Co., F. J.	286
Lodge & Shipley Co.	149
Logansport Machine Co., Inc.	233
Luers, J. Milton	260
Lyon Machine Co.	180
M & N Machine Tool Works	180
Macmillan Co.	182
Manheim Mfg. & Belting Co.	293
Marshalltown Mfg. Co.	258
McGraw-Hill Book Co., Inc.	248, 296
McKiernan-Terry Corp.	270
Meisel Press Mfg. Co.	242
Meyers Co., Inc., W. F.	191
Milford Rivet & Machine Co.	288
Moline Tool Co.	290
Monarch Machine Tool Co.	155
Motch & Merryweather Co.	189
Murchey Machine & Tool Co.	139
National Acme Co.	35
Nat'l. Automatic Tool Co., Inc.	167
National Lock Co.	288
National Lock Washer Co.	255
National Machinery Co.	312
National Machine Tool Co.	241
National Screw & Mfg. Co.	288

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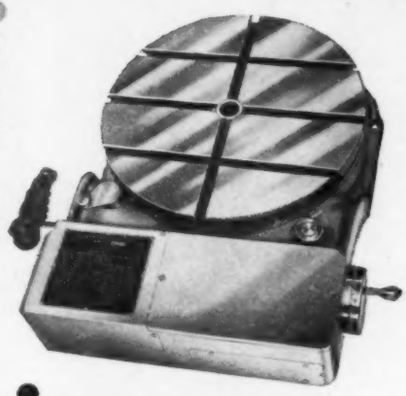

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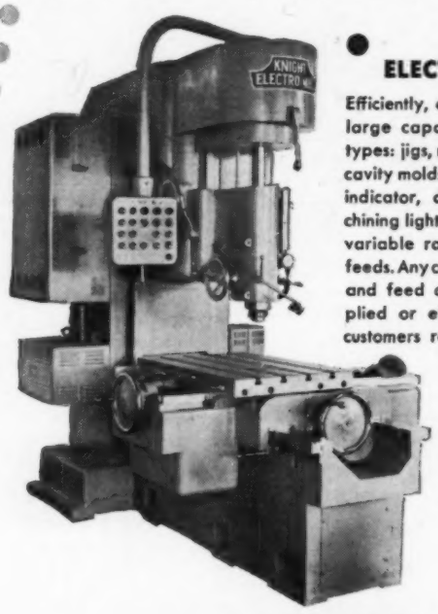

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ADVERTISERS INDEX

	Page
National Twist Drill and Tool Co.	37
Newark Gear Cutting Machine Co.	241
New Britain-Gridley Machine Div. New Britain Machine Co.	146
New England Screw Co.	288
Nicholson & Co., W. H.	274
Nicholson File Co.	211
Noble & Westbrook Mfg. Co.	174
Norma-Hoffmann Bearings Corp.	297
North Bros. Mfg. Co.	182
Norton Company	18, 19
Oakite Products Inc.	256
Oilgear Co.	237
Oliver Instrument Co.	244, 278
O'Neil-Irwin Mfg. Co.	186
Optimus Equipment Co.	186
Ottemiller Co., Wm. H.	274
Parker Appliance Co.	284
Parker-Kalon Corp.	288, 291
Parker Rust Proof Company	220
Pawtucket Screw Co.	288
Peninsular Grinding Wheel Co.	42, 43
Pheoll Manufacturing Co.	288
Phillips Screw Manufacturers	288
Photographers' Ass'n. of Amer.	294
Pittsburg Gear Co.	242
Potter-Johnston Machine Co.	55
Pratt & Whitney Div., Niles Bement-Pond Co.	63
Production Machine Co.	234
Railway Express Agency Div.- Air Exp.	250
Randall Co., Frank E.	258
Reading Screw Co.	288
Red Wing Motor Co.	294
Reliance Electric & Engrg. Co.	253
Republic Steel Corp.	198, 199
Robertson Mfg. Co.	74
Roberts Rubber Co., Weldon	210
Russell Burdsall & Ward Bolt & Nut Co.	288
Ruthman Machinery Co.	266
S. K. F. Industries Inc.	239
Safety & Maintenance Co.	176
Sales Service Machine Tool Co.	192
Scherr Co., Inc. George	236
Schrader's Son, A.	251
Scovill Manufacturing Co.	288
Seaboard Screw Corp.	288
Severance Tool Industries Inc.	241
Sewall Mfg. Co., E. B.	194
Shakeproof, Inc.	288
Sheldon Machine Co., Inc.	287
Shore Instrument & Mfg. Co., Inc.	258
Sibley Machine & Foundry Corp.	168
Simonds Saw & Steel Co.	73
Skinner Chuck Co.	216
Snow Manufacturing Co.	221
Socony Vacuum Oil Co., Inc.	222
South Bend Lathe Works	208
Southington Hardware Mfg. Co.	288
Square D Co.	179
Stahl Gear & Machine Co.	242
Standard Conveyor Co.	190
Standard Oil Co., of California	217
Standard Oil Co. (Indiana)	263, 264
Standard Pressed Steel Co.	32, 296
Star Electric Motor Corp.	197
Starrett Co., L. S.	140
Steel Co. of Canada Ltd.	288
Steelweld Machry. Div., Cleveland Crane & Engrg. Co.	157
Sterling Bolt Co.	288
Sterling Electric Motors Inc.	195
Sterling Grinding Wheel Div.	183
Stewart Warner Corp.	161
Strand Co., N. A.	266
Strong Carlisle & Hammond Co.	290
Stronghold Screw Products Inc.	288
Stuart Oil Co., Ltd., D. A.	238
Sundstrand Machine Tool Co.	14, 15
Sweets Catalog Service	282
Taft-Peirce Mfg. Co.	298
Taylor & Fenn Co.	184
Tennessee Coal, Iron & Railroad Co.	24, 25
Texas Co.	80
Thompson Grinder Co.	228
Thompson & Son Co., Henry G.	178
Timken Roller Bearing Co.	4th Cover
Tuthill Pump Co.	296
United States Products Co.	270
United States Steel Corp.	24, 25
U. S. Steel Export Co.	24, 25
V. & O. Press Co.	260
Valvair Corp.	270
Van Keuren Co.	54
Van Norman Co.	8, 9
Vascaloy Ramet Corp.	213
Vitrified Wheel Co.	262
Vulcan Tool Corp.	67
Wade Tool Co.	292
Waldes Koh-I-Noor, Inc.	209
Wales-Beech Corp.	288
Walker Co., O. S.	266
Walker Turner Co., Inc.	207
Waltham Machine Works	248
Waltham Screw Co.	232
Warner & Swasey Co.	69
Wendt-Sonis Co.	166
White & Bagley Co.	282
Whitman & Barnes	212
Whyte Engineering Co.	254
Wilson Mechanical Instrument Co.	262
Winter Brothers Co.	36
Wolverine Bolt Co.	288
Wyckoff Steel Co.	261
Youngstown Sheet & Tube Co.	295

EMPLOYMENT

Positions Vacant	299, 300
Positions Wanted	300
Employment Services	300

SPECIAL SERVICES

Contract Work	299
Dayton Rogers Mfg. Co.	299
General Pattern Works	299
Harmon Machine Co., Inc.	299
Kamis Engineering Co.	299
Universal Thread Grinding Co.	299
White Engineering Works, Inc.	299

	Page
NOTICES	
Auction	300
Rosen, Ralph	300
EQUIPMENT (Used or Surplus New) For Sale	300-311
WANTED Equipment	300

ADVERTISERS INDEX

Aaron Machinery Co.	309
Barron Machinery Co.	310
Bennett Machinery Co.	311
Billard Machine & Tool Co.	302
Botwinik Bros. of Mass., Inc.	310
Brooks Inc., B. D.	302
Brownell, Hazard	306, 308
Continental Salvage & Machinery Corp.	311
Davis & Assoc., B. M.	308
DeWitt Tool Co.	300
Dony Machinery Co.	304
Eastern Machinery Co.	305
Eastern Tool Supply Co., Inc.	310
Emerman Machinery Corp.	306
Falk Machinery Co.	301
Fairchild Aircraft Division	300
Glazer Steel Corp.	300
Hasco Machinery Co.	308
Hill-Clarke Machinery Co.	302
Hyman & Son, Joseph	304
Indianapolis Machy. & Supply Co.	307
Kendo Machine Co.	300
Kings County Machy. Exchange	308
Lang Machinery Co.	306
Liberty Planers, Inc.	311
McDonald Machinery Co.	311
Miles Machinery Co.	310
Morey Machinery Co.	303
National Machinery Exchange Inc.	306
National Trading & Mfg. Co., Inc.	308
Northwest Gear Co.	300
O'Brien Machinery Co., The	306
Osborne & Sexton Machinery Co.	306
Paul's Machinery Co.	311
Reynolds Machinery Co.	304
Schultz & Anderson Co.	308
Simmons Machine Tool Co.	311
Smith, Drum & Co.	300
Sun Machinery Corp.	308
United Machinery & Tool Corp.	304
Victor Machinery Exchange	302
War Surplus Co.	300
West Penn Machinery Co.	302
Wigglesworth Machinery Co.	304

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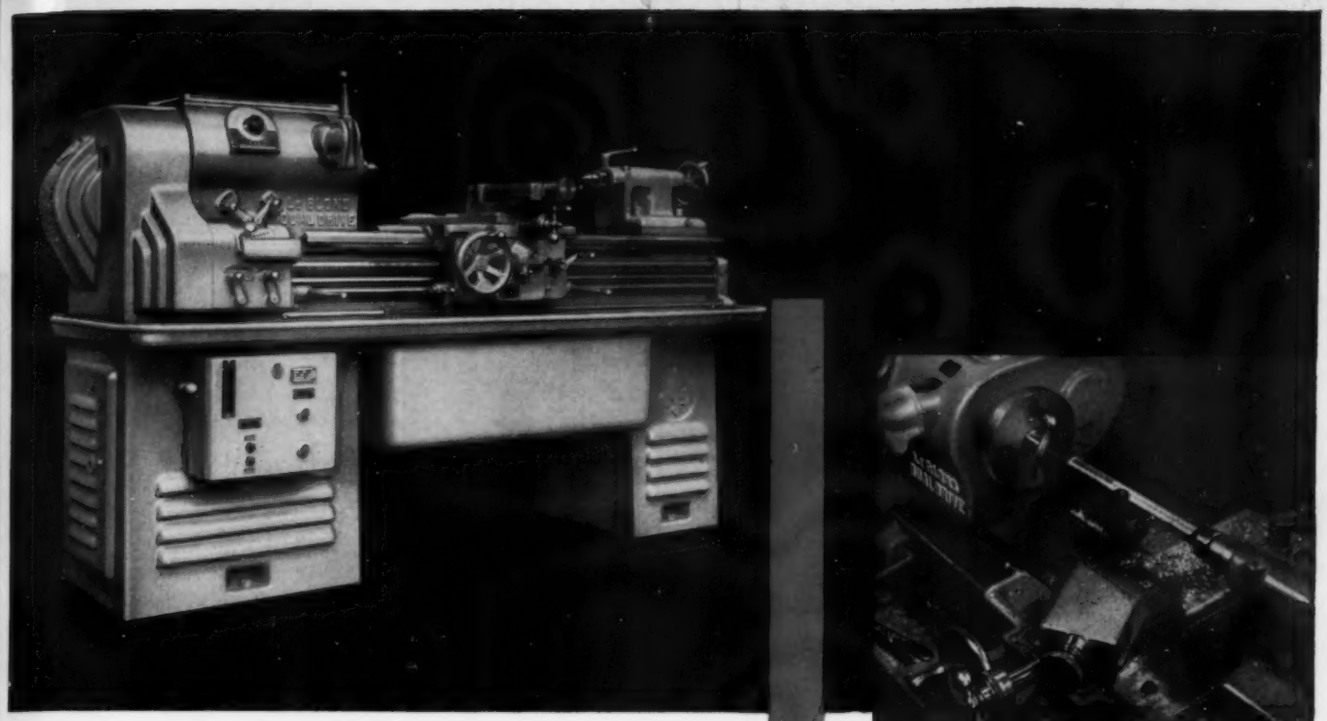

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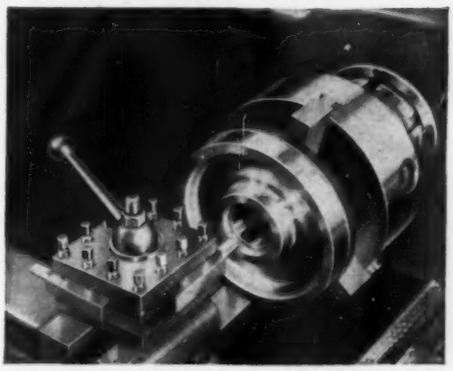

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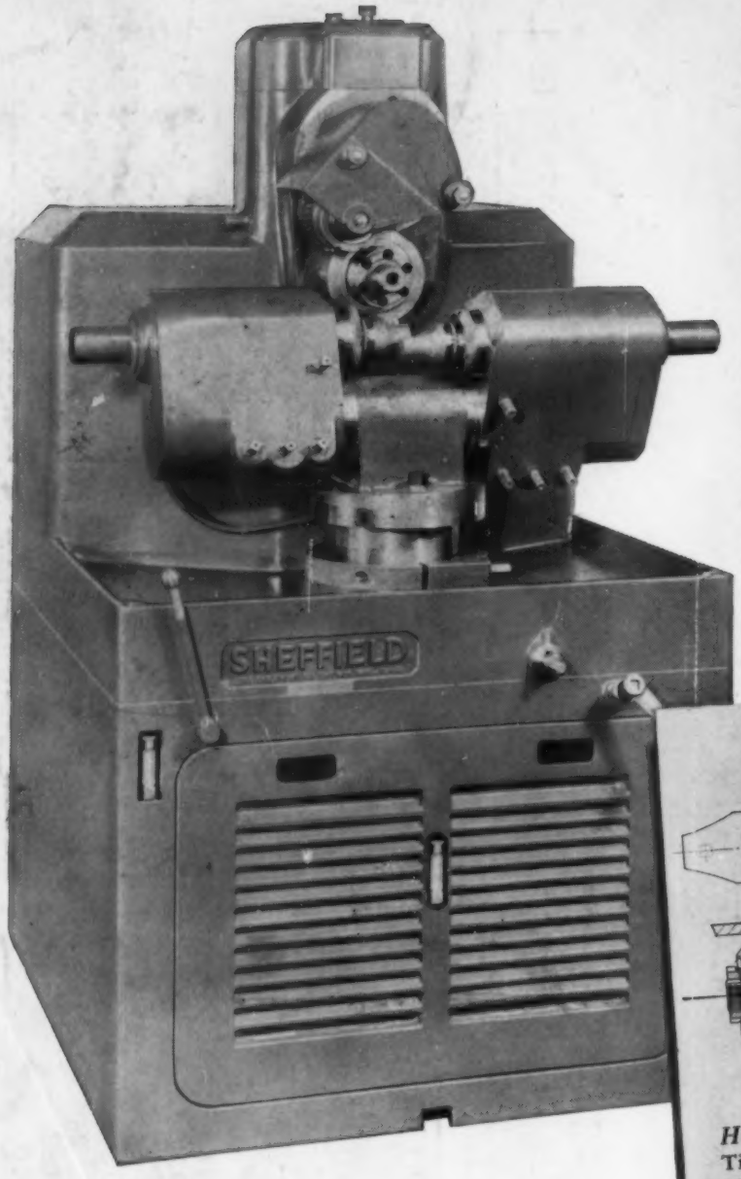


THE Sheffield Corporation of Dayton, Ohio, mount the spindles of their gear burring machine on Timken roller bearings to remove burrs quickly and cleanly without impairing the precision or damaging the surface of the gears themselves.

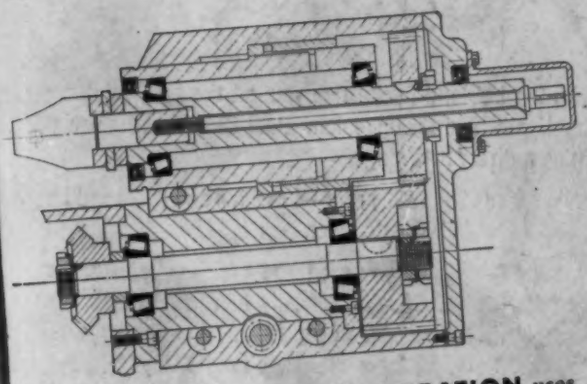
Timken bearings hold spindles rigid, yet free to rotate easily. Due to the line contact between the rolls and races, the spindle is rigidly supported—no chance of deflection. Because of tapered construction and provision for take-up in assembly, there is no possibility of end-movement. And the true-rolling motion and incredibly smooth surfaces of Timken bearings practically eliminate friction.

Made of Timken fine alloy steel, Timken bearings normally last the life of the machine. Bearing wear is negligible; spindles *keep* their precision for long years of service.

No other bearing can give you *all* the advantages you get with Timken bearings—backed by 49 years of research and development. Make sure the trademark "Timken" is on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



How the **SHEFFIELD CORPORATION** uses Timken bearings to assure spindle accuracy in their Model 350 gear burring machine. A total of 24 Timken bearings are used throughout the machine.

FINISHED TO CLOSER TOLERANCES

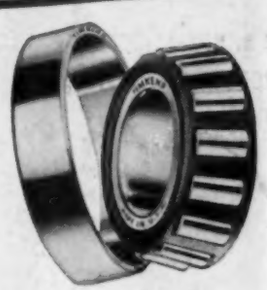
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at Timken.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ⊣◫⊢ LOADS OR ANY COMBINATION ⊣✳⊢